# Will policies in the early years reduce inequalities in health?
# A synthesis to inform policy

A thesis presented for the degree of
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I, Anna Pearce, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

# Abstract

This thesis aims to examine whether government policies in the early years are likely to influence health inequalities, using information derived from a range of sources to contribute to the 'jigsaw of evidence', and focussing on two case studies featuring high on the Labour government agenda: the first a measure of health (unintentional injury) and the second a policy (childcare). Scoping reviews were used to map areas requiring further research for each case study. A review of policy documents helped set the policy context, and secondary datasets were utilised to describe prevalence, trends and inequalities. Following this some of the less researched associations identified in the scoping reviews were explored, using data from the Millennium Cohort Study (MCS).

An analysis investigating whether the home environment lay on the causal pathway between socio-economic circumstances (SECs) and unintentional injuries found that controlling for a number of proxy measures for housing quality and safety equipment use did not alter the social gradient in injuries occurring in the home. A second analysis exploring a measure of main childcare use in relation to injuries found that infants (aged 9 months) from more advantaged SECs were less likely to have been unintentionally injured (anywhere) since birth if they were looked after in formal childcare (compared to those looked after only by a parent). In contrast, those from less advantaged SECs appeared to be at greater risk of injury. Informal childcare was associated with an increased risk of injury between 9 months and 3 years, overall and in less advantaged SECs. Two further analyses explored breastfeeding and overweight in relation to childcare use. Informal and formal childcare were both associated with a reduced likelihood of breastfeeding, and whilst this remained the case for informal childcare across all social groups, for formal childcare the reduced likelihood of breastfeeding was only observed in those from more advantaged groups. Children who were looked after in informal childcare appeared to be more likely to be overweight at 3 years than those only looked after by a parent, particularly if they were from more advantaged SECs. These results were then synthesised in light of current and potential policy.

The analyses were conducted with observational data and using proxy measures for the home environment and main childcare use, therefore further research is required. Findings imply that improvements to the home environment may not necessarily influence inequalities in injuries (although are likely to benefit other areas of health and wellbeing). Main childcare type appeared to be associated with better health outcomes

for some social groups but not for others; further research is required to ascertain how these benefits can be recognised for all groups, for example through improved training and guidance for childcare professionals. This thesis demonstrates the use of epidemiological information for contributing to the 'jigsaw of evidence', but also the complexities of considering policy impacts on health inequalities.

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# Abbreviations

| | |
|---|---|
| **A&E** | Accident and emergency department |
| **AD** | Absolute difference |
| **ALSPAC** | Avon Longitudinal Study of Parents and Children |
| **CHPP** | Child Health Promotion Programme |
| **CI** | Confidence interval |
| **CMO** | Chief Medical Officer |
| **CLS** | Centre for Longitudinal Studies, Institute of Education |
| **CRB** | Criminal Records Bureau |
| **DH** | Department of Health |
| **DCSF** | Department of Children, Schools and Families |
| **DfES** | Department for Education and Skills |
| **EHCS** | English House Conditions Survey |
| **EPPE** | Effective Provision of Pre-School Education |
| **EYPS** | Early Years Professional Status |
| **GB** | Great Britain |
| **GCSE** | General Certificate of Secondary Education |
| **GHS** | General Household Survey |
| **GP** | General Practitioner |
| **HES** | Hospital Episode Statistics |
| **HCP** | Healthy Child Programme |
| **HSE** | Health Survey for England |
| **ICD** | International Classification of Diseases |
| **IFS** | Infant Feeding Survey |
| **IMD** | Index of Multiple Deprivations |
| **IOTF** | International Obesity Task Force |
| **LEA** | Local Education Authority |
| **MCS** | Millennium Cohort Study |
| **NCB** | National Children's Bureau |
| **NCMP** | National Child Measurement Programme |
| **NICE** | National Institute for Health and Clinical Excellence |
| **NS-SEC** | National Statistics Socio-Economic Classification |
| **OECD** | Organisation for Economic Cooperation and Development |
| **ONS** | Office for National Statistics |
| **PEAR** | Public Health, Education, Awareness, Research (young person's reference group) |
| **PHO** | Public Health Observatory |
| **PHRC** | Public Health Research Consortium |
| **PSA** | Public Service Agreement |
| **RCT** | Randomised controlled trial |
| **RoSPA** | Royal Society for the Prevention of Accidents |
| **RD** | Relative difference |
| **RR** | Risk ratio |
| **SECs** | Socio-economic circumstances |
| **SOA** | Super Output Area |
| **UK** | United Kingdom |
| **UNICEF** | United Nations Children's Fund |
| **US** | United States of America |
| **WHO** | World Health Organisation |
| **NSF** | National Service Framework |
| **YHPHO** | Yorkshire and Humber Public Health Observatory |

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# 1 Chapter 1 – Aims and objectives

This thesis aims to explore whether policies in the early years might influence inequalities in child health, using two case studies, piecing together a range of epidemiological data and using contextual information to set the public health and policy scene. It is based on work conducted between September 2007 and May 2010 and so the rationale and analyses conducted throughout this project were guided by Labour policies which were in place or proposed during the Labour administration. However changes which have been announced by the new Conservative-Liberal Democrat Coalition Government, which came into power in May 2010, have been taken into account to some extent in the final chapters of this thesis (Chapters 10 and 11).

In this chapter I provide the rationale for this programme of research, describing the child health policy context in the UK and the different approaches that can be used to evaluate the impact of policies on health and inequalities in health (1.1). Following this I present the objectives of the thesis (1.2) and its structure (1.3), the role of researcher (1.4) and ethics approval (1.5).

## 1.1 Background

### *1.1.1 Policy context for children's health, during the Labour administration*

During the Labour administration of 1997-2010, more than twenty policies with the potential to influence the health and social distribution of health were introduced[1]. Many Labour policies focussed on the health of the general population as opposed to the health of children, including two public health White Papers in 1999 ("Saving lives: our healthier nation")[2] and 2004 ("Choosing health: making healthier choices easier")[3] and "Tackling health inequalities: programme of action" in 2003[4]. However over this period an important shift in policy direction occurred, with a general change in public and political opinion to prioritise the promotion of child health and wellbeing[1;5;6].

Figure 1.1 presents Labour policies which focussed on the health of children and young people of all ages. A wide range of other policies which focus on the wider determinants of health (for example housing and poverty), rather than health directly, have not been included. In 2003, the "Every child matters" green paper proposed a programme of reform designed to protect children and maximise their potential through multi-agency

working, and was measured against five main outcomes: being healthy, staying safe, enjoying and achieving, making a positive contribution, and economic wellbeing[7]. In 2004 "Every child matters: Change for Children" laid out a national framework for achieving this transformation of services[8] (Figure 1.1), and one year later the Children Act was passed to legislate the changes[9]. In 2005 core standards for health and social care professionals were published in the National Service Framework (NSF) for children and young people[10]. Included within the framework was the Child Health Promotion Programme (CHPP), which laid out all of the services that parents could expect throughout pregnancy and the first 18 years of their child's life. These services would be offered by all practitioners coming into contact with children and young people, based on best available evidence and focussing on priority areas such as healthy eating, physical activity, safety, smoking and mental health [10].

In 2007 the Department for Education and Skills (DfES) was replaced by the Department for Children, Schools and Families (DCSF), to reflect the all-encompassing focus of this transformed department on all issues affecting the lives of children. Six months later DCSF published the Children's Plan[11], which, building upon Every child matters and the Children's Act, set out the vision of the department for the following decade. This included a Public Service Agreement (PSA) to improve the health and wellbeing of children and young people through increasing breastfeeding rates and the percentage of children receiving school lunches, tackling childhood obesity and promoting children's emotional and mental wellbeing, and improving services for parents with disabled children. In 2009 "Healthy lives, brighter futures" was jointly launched by the Department of Health (DH) and DCSF, the first government strategy to focus solely on the health of children and young people[12]. Underpinning the standards and ambitions laid out in previous policy documents, such as the NSF for children and young people and maternity services, Every child matters, and the Children's Plan, it presented a series of policies to achieve its vision of England being the best place for children to grow up by 2020. Under the strategy the role of SureStart centres would be strengthened and the CHPP was renamed the Healthy Child Programme (HCP) (with additional guidance produced for the period 5-18 years[13] to complement an existing programme from birth to five years, which is discussed shortly).

Figure 1.1 also highlights policies which specially targeted health in the early years; the first was Sure Start, which was launched towards the beginning of Labour's

administration in 1998. At its inception, Sure Start was designed to provide quality services to children under the age of four living in the 20% most deprived areas in England and their families [14]. Sure Start programmes were free to develop and improve services as they wished, but were expected to provide the following services: outreach and home visiting, support for good quality play, learning and childcare experiences, primary and community health care and advice, and support for people with special needs[14]. Sure Start evolved over the following few years, becoming Sure Start Children's Centres in 2005. These centres were to offer a more specific set of services and guidelines, and control was transferred from central government to local authorities[14]. Subsequent policies aimed specifically at the early years were not introduced until several years after the launch of Sure Start. In 2006 the Healthy Start scheme, replaced the Welfare Food Scheme, providing vouchers for fresh milk, infant formula, fresh fruit and vegetables to low income families and teenage mothers during pregnancy and up until the child's fourth birthday[15]. In this same year the Childcare Act was passed, the first government legislation to be exclusively concerned with the early years and childcare[16]. The Act was designed to transform childcare and early years services, supporting a new ten year childcare strategy which had been launched two years earlier in 2004[17]. In 2008, detailed guidance for the CHPP was produced aimed specifically for services from birth to five years[18], laying out a programme of screening tests, immunisation schedules, developmental reviews, and information and guidance for parents. As stated earlier, the programme was renamed the Healthy Child Programme (HCP) in 2009, under the remit of "Healthy lives, brighter futures"[12;19].

Inequalities can be seen in many aspects of child health in the UK, for a variety of measures of socio-economic status including area level deprivation, ethnicity, and social class. Children from less advantaged backgrounds show higher rates of infant mortality[20], low birthweight[20;21], unintentional injuries[22-24], overweight[25;26], respiratory illness[27], and chronic disease[20]. Mothers from less advantaged backgrounds are also more likely to smoke in pregnancy[20] and less likely to breastfeed[28-30] and have their child immunised [31;32].

Many of the policies discussed previously were not only aimed at improving the overall health of children, but also reducing inequalities in health. Some were targeted specifically at less advantaged groups; for example Sure Start was originally introduced in deprived areas and the Healthy Start scheme was available only to teenage mothers or

those on low incomes. “Tackling health inequalities: programme for action” was launched in 2003, with two national targets announced in 2001 to reduce inequalities in life expectancy and in infant mortality by 2010. Whilst the other policies were not primarily aimed at reducing health inequalities in children, all acknowledged the importance of considering the impact across the social spectrum and the need to target groups which are at greater risk of poor health outcomes (such as those from less advantaged backgrounds)[8;10-12;18].

### *1.1.2 Approaches for evaluating the health impacts of policies*

There are three main areas of focus for research surrounding health inequalities: describing and documenting health inequalities, investigating the pathways which might lead from social position to health, and evaluating the impact of interventions in different social groups[33]. A wide range of evidence documenting the magnitude of inequalities in health already exists[34;35], although continuing research in this area may help to raise awareness amongst policy makers of the extent of the problem[33]. In contrast, less is known about the mechanisms through which social position influence health, particularly since these patterns pervade many countries and societies regardless of absolute levels of affluence and access to material goods[5]. With regards to the third area of health inequalities research, it is agreed that there is a paucity of research exploring the effects of all policies on health inequalities (for example social or economic policies which may have “unintended, spill over effects” [36]), and those specifically designed to reduce inequalities in health[33;35-38].

Government policies and initiatives are typically implemented in ways that make it difficult to assess their potential impact[34]. For example new interventions are often put in place before baseline data can be collected, and are rarely randomly allocated (making it hard to identify suitable comparison groups). Randomised controlled trials (RCTs) are highly regarded for clinical decision making purposes, because they minimise selection bias and control for potential confounding. However they are rarely feasible for the evaluation of large scale interventions[39]. Firstly, interventions implemented under routine RCT standards may not produce similar results when replicated out in the field. They are better suited to interventions with clear and short causal pathways, which government interventions typically do not have[39]. Furthermore, randomly allocated interventions are resource intensive when conducted on a large scale, and they are vulnerable to poor compliance or crossover effects between groups[39].

Some social interventions, such as those which aim to alter the social determinants of health, may already be widespread in use[40] or due to practical or ethical reasons not amenable to "experimental manipulation" [36].

Policy makers and academic researchers have highlighted that the most valuable information for policy making rarely comes from one source alone, but from a range of different sources[39], such as classic observational studies, interventions, natural policy experiments and qualitative research, which are pieced together to provide a 'jigsaw of evidence'[41]. However studies and systematic reviews rarely report whether differential effects were observed by socio-economic status[42]; therefore existing 'pieces' of the jigsaw for assessing policy impacts on health inequalities are scarce. Secondary data can be used to fill these gaps and provide feasible alternatives to experimental research[36], particularly if confounding factors can be accounted for[39] and especially when exploring more complex issues such as health inequalities[41]. These might include sub-group comparisons within a cohort between individuals who are 'exposed' or 'unexposed' to a policy area. For example, the Labour government aimed to increase maternal employment as a route out of poverty, and by comparing the health of a cohort of children whose mothers were and were not in paid employment it has been possible to assess potential impacts of this policy aim[43]. Historical or geographical comparisons can also be made, for example by comparing populations in different countries with varying policy contexts[44;45].

## 1.2 Aims

The aim of this thesis is to fill some of the gaps identified in the previous section (1.1.3), by synthesising evidence from a number of sources (or "jigsaw pieces") in order to explore how government policies in the early years might influence inequalities in child health. The majority of these jigsaw pieces are derived from epidemiological analyses using secondary datasets, however existing research and policy documents are also taken into account in order to set the context. The work was carried out using two case studies. The first case study is a health outcome, designed to investigate how inequalities in a particular aspect of health might be influenced by a range of policies. The second case study focuses on a policy, in order to explore how one particular policy might influence inequalities in different aspects of children's health.

The project consists of three phases:

### *1.2.1 Phase 1*

The objectives for Phase 1 are:

- To select the two case studies (one policy, one health outcome), based on relevance to the early years, level of government priority, the extent to which the policies and health outcomes were socially distributed, the availability of appropriate measures and data, and, in the case of the health case study, amenability to change. The health outcome selected is ***unintentional injury***, and the chosen policy is ***childcare***.
- To conduct a review of reviews in order to create maps of review evidence which demonstrate the associations (or links) between policies and health inequalities for each case study, highlighting links which are better researched and areas potentially requiring further research.
- To select links requiring further research in the maps of review evidence for the two case studies, to be explored using secondary data analysis in Phase 2.
- To establish the policy context for the two case studies (unintentional injury and childcare) in the UK.
- To describe the prevalence, inequalities and trends in unintentional injury and childcare uptake in the UK and the additional policies and aspects of health featuring in the links using secondary data analysis.

The methods for Phase 1 are described in Chapter 2, and the results are provided in Chapters 3 (for injury) and 4 (for childcare).

### *1.2.2 Phase 2*

The objectives for Phase 2 are:

For the injury case study:

- *Home environment and inequalities in injury:* To examine the association between the home environment and inequalities in unintentional injury occurring in the home using secondary data analysis (Chapter 5).
- *Childcare and inequalities in unintentional injury:* To examine the association between childcare and inequalities in unintentional injury using secondary data analysis (Chapter 6) (this analysis provides the overlap between the two case studies).

For the childcare case study:

- *Childcare and inequalities in unintentional injury:* To examine the association between childcare and inequalities in unintentional injury using secondary data analysis (Chapter 6) (as above).
- *Childcare and inequalities in breastfeeding:* To examine the potential impact of childcare on inequalities in breastfeeding using secondary data analysis (Chapter 7).
- *Childcare and inequalities in overweight (including obesity):* To examine the potential impact of childcare on inequalities in overweight using secondary data analysis (Chapter 8).

The main data analyses in Phase 2 were carried out using the Millennium Cohort Study (MCS), because it was identified as the best placed dataset to explore the link between policies and inequalities in child health (given the sample design and size, range of information collected and timeliness, which are described in Chapter 2). The common methods used throughout Phase 2 are presented in Chapter 2; methods specific to individual links are presented in Chapters 5 to 8, along with the results for each analysis.

### *1.2.3 Involving young people in research*

Two sessions were held with a young person's reference group (PEAR "Public health, Education, Awareness, Research"), which is run by the National Children's Bureau (NCB). The sessions were held at two different points in the project (spanning Phases 1 and 2), and the objectives were to:

- Involve young people in research.
- Gain young people's views on:
    - How the government might influence inequalities and health (using the examples of unintentional injury and childcare) (session 1, February 2008).
    - What the findings from the MCS analyses in Phase 2 might mean and what the government might do as a result (session 2, February 2010).

The methods and materials used in the sessions and the resulting group discussions are presented together, in Chapter 9.

### *1.2.4 Phase 3*

The objective in Phase 3 was to:

- Synthesise the results from Phases 1 and 2, in light of current and potential policy (Chapter 10)

## 1.3 Structure of the thesis

All chapters open with the main objectives for that chapter. This programme of research has been iterative in nature, with findings in the first half of Phase 1 determining what was explored later on in Phase 1 and also in Phase 2. Therefore Chapter 2 is divided into three sections. The first refers to the 'Development of Phase 1'. This section reports the methods used for Phase 1, and also some of the results, where they have been used to inform decisions later in that phase. The second section 'Methods for Phase 2' also presents the common approaches used in Phase 2 (methods sections for each individual analysis conducted in Phase 2 are presented in the relevant chapters). The third, 'Methods for Phase 3' summarises the approach used to synthesise the findings from Phases 1 and 2.

The main findings from Phase 1 are presented in Chapter 3 (for the unintentional injury case study) and Chapter 4 (for the childcare case study) and consist of: the maps of review evidence documenting better and less well-researched links; the policy context; and the prevalence, trends and inequalities in unintentional injuries or childcare.

Chapters 5 to 8 refer to the individual secondary analyses conducted in Phase 2 for each of the links. Each of these chapters firstly present the trends and inequalities in the additional measures featuring in that particular analysis: the home environment in Chapter 5, breastfeeding in Chapter 7, and overweight in Chapter 8 (Chapter 6 focuses on the association between childcare and injury and so all background information had been presented in Chapters 3 and 4). Following the presentation of these additional data, each chapter is presented using a traditional paper format: background, methods, results and discussion.

The methods and findings from the two sessions carried out with the young people's reference group (PEAR) are described together in Chapter 9. In Chapter 10 the findings from Phases 1 and 2 are summarised and then synthesised in light of current and

potential policy. The results chapters (3-10) contain strengths and limitations specific to each chapter. In Chapter 11 the overarching strengths and limitations of the thesis are discussed, alongside implications for policy, areas for further research, and concluding remarks.

## 1.4 Role of the researcher

The work presented in this thesis was carried out as a project under the Public Health Research Consortium (PHRC) (http://www.york.ac.uk/phrc), which is funded by the Department of Health. The project bears the same title as this thesis, and was carried out from September 2007 until May 2010. The principal investigator was Catherine Law (also my primary PhD supervisor) and the co-investigators were: Jake Abbas, Brian Ferguson, and Hilary Graham. These people, along with my secondary PhD supervisor, Leah Li, are hereafter collectively referred to as the 'project team'. I was the primary researcher on the project and responsible for its day-to-day coordination, including selecting the methods, conducting the data analysis, and writing papers for publication or to update the rest of the project team. Whilst much of the work presented in this thesis was conducted by me under the auspices of the PHRC project, the content of the thesis itself was written only in consultation with my PhD supervisors, and not the rest of the project team. My role throughout the project is specified in more detail below.

The descriptive statistics presented in this thesis were derived from the Millennium Cohort Study (MCS) and several other national datasets. The national datasets (excluding the MCS) were identified, and their suitability for this project assessed, either by the Yorkshire and Humber Public Health Observatory (YHPHO) as part of the project (with instruction from me), or by me as part of previous projects (and in collaboration with Richard Jenkins, UCL Institute of Child Health)[46;47]. I designed protocols for the analysis of data from the national datasets (excluding the MCS), which were then accessed, cleaned and categorised at the YHPHO or by the Information Centre.

The MCS data were downloaded from the UK Data Archive in April 2008. The data were cleaned and the variables constructed by: me, other members of the MCS Child Health Group at the UCL Institute of Child Health (ICH), or the Centre for Longitudinal Studies (CLS). The main variables used throughout this thesis (measuring childcare and injury) were constructed by me. Variables which I constructed or modified are marked *

in the methods section (Chapter 2). All analyses conducted using the MCS were designed and carried out by me.

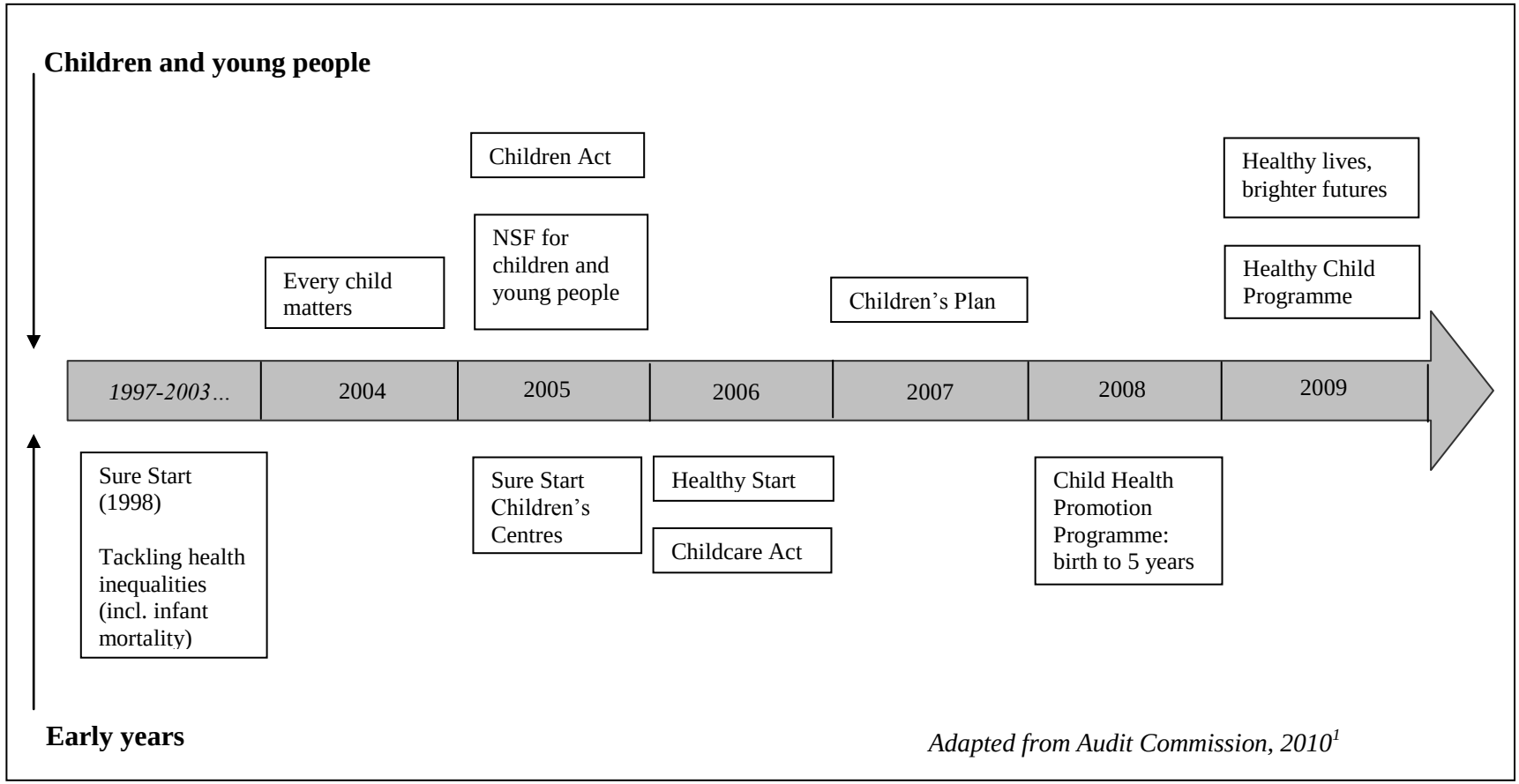
The materials used in both sessions with the PEAR group were produced by me, with advice from Louca-Mai Brady, Senior Research Officer at the National Children's Bureau (NCB). The sessions were run by me, and overseen by Louca-Mai Brady. I was responsible for writing up the findings from the session and producing feedback for the PEAR group.

A number of publications have resulted from this programme of work (Appendix 1). I was first author on these papers, and the rest of the project team were also named authors. Some of the results from Chapters 6[48], 7[49], and 8[50] have been published in peer reviewed journals. Some of the results from Chapter 5 have also been written up for publication and are currently under review. Many of the findings presented here were also written up by me, in a report to the Department of Health which is required for all PHRC projects and is also subject to peer review (http://www.york.ac.uk/phrc/).

## 1.5 Ethics approval

The majority of the work in this thesis did not require ethics approval, because it uses existing research and secondary data analysis. Ethics approval was gained for the work with the PEAR group, detailed in Chapter 9. Ethics approval for the collection of the MCS data was applied for by the Centre for Longitudinal Studies and this is detailed in Chapter 2.

*Figure 1.1: Timeline of policies designed to directly influence child health throughout the Labour administration (1997-2004)*



# 2 Chapter 2 – Methods

This chapter reports the methods used for all three phases of the project, and is divided into three sections corresponding to each of the phases. Phase 1 was carried out using an iterative process and therefore some results are presented, where these informed methods used later on in that phase or in subsequent phases. The first section of this chapter is therefore referred to as the 'Development of Phase 1'. The second and third sections only refer to methods used in Phases 2 and 3, and are therefore titled 'Methods for Phase 2' and 'Methods for Phase 3'. Each of the three sections opens with an outline of the objectives relevant to that section. Strengths and limitations for each Phase are also discussed.

## Development of Phase 1

### 2.1 Objectives

The objectives for the development of Phase 1 were to:

- Select the two case studies (2.2)
- Conduct a review of reviews to produce maps of review evidence demonstrating the links between policies and health for each case study (2.3)
- Select links in the case studies to explore using secondary data analysis in Phase 2 (2.4)
- Describe the data sources and measures used to describe the case studies in Phase 1, and to investigate the links in Phase 2 (2.5)

### 2.2 Selecting the two case studies

As described in Chapter 1, the project focuses on two case studies, one investigating a health outcome, and the other a policy. This section describes how the two case studies were selected.

#### *2.2.1 Producing menus of potential health outcomes and policies*

**Health outcomes**

Relevant child health outcomes were considered to be health conditions (such as asthma), children's health behaviours (e.g. physical activity), and maternal health behaviours which are likely to directly influence the health of the child (for example breastfeeding). To compile a menu of health outcomes relevant to policy, searches were

carried out in October 2007 of the following: national headline indicators[4] and local basket of indicators[51] devised to monitor progress towards the national inequalities targets; existing (2005-08)[52] and future (2008-11)[53] Public Service Agreement (PSA) targets or goals; the National service framework for children, young people and maternity services[10]; Every child matters[7]; and the public health White Paper "Choosing health"[3]. Health outcomes which would have no direct potential relevance for the early years or children (e.g. cardiovascular disease) were excluded. Figure 2.1 lists the menu of health outcomes which were identified in the searches.

**Policies**

Policies with the potential to influence young children's health (including maternal factors) were identified through searching government department websites, such as the Department of Health (DH) and the Department of Children, Schools and Families (DCSF); searching key documents, such as the 2007 Pre-Budget Report and Comprehensive Spending Review (which contained 2008-11 PSA targets)[53] and the public health White Paper[3]; and scanning relevant charity or think tank websites, such as the King's Fund and the Institute for Public Policy Research. Searches were carried out in November 2007. Policy areas which were not relevant to the early years (for example improved social care in adults[54]) were excluded. The search identified policy aims (such as to increase parental employment[55]) and specific programmes or schemes which fell under these aims (e.g. Pathways to Work[56]). It was anticipated that a policy aim would be selected for the case study, rather than a specific programme, since questions surrounding specific schemes are rarely collected in national surveys and cohorts. Figure 2.1 shows the menu of policy aims. Appendix 2.1 contains a list of the policy schemes/programmes identified in the search.

### *2.2.2 Assessing the health outcomes and policies in the menus*

The methods used to select the two case studies were designed to be iterative in order to aid the decision-making process (for example it was decided that the two case studies should potentially be associated and therefore they could not be chosen independent of each other). A list of considerations was produced to assess the potential health outcomes and policies in the menus and draw up shortlists. The health outcomes and policies in the shortlists were then considered in more depth, taking into account the original assessment criteria and also other arising issues, such as possibility of replicating current work already being carried out by other research groups.

**Health outcomes**

The initial assessment criteria for the health outcomes are outlined below. For each of the criterion, the health outcomes were assigned a tick (✓) if they rated positively, a zero (0) if they rated neutrally, and a cross (✗) if they rated negatively.

*1. Priority?* What level of priority has this health outcome been given by government?

✓= Government target for improvement in children;

0= Universal target (no focus on early years);

✗ = No target.

*2. Degree of inequalities?* To what extent is the health outcome socially distributed?

✓= High level of inequalities;

0= Moderate level of inequalities;

✗ = Low level of inequalities.

*3. Long term impact?* Is the health outcome known to have an impact on other outcomes later on in life (for example birth weight is known to influence a range of outcomes across the life course[57])?

✓= Evidence for influence across the life course;

0= Limited evidence but may still have an influence;

✗ = No evidence and unlikely to have an influence.

*4. Intervening variables/proxies?* Is it possible to measure intervening variables or proxy measures (e.g. for obesity these could be physical activity or diet)?

✓= Some proxies or intervening variables (or none needed);

0= No intervening variables available.

*5. Evidence base?* Is there already a strong evidence base with regards to policy interventions?

✓= Limited evidence (little known about impact of policies)

0= Some evidence (some knowledge, or unlikely to be amenable to change)

✗ = Strong evidence.

*6. Amenable to change?* How likely is it that this outcome can be influenced through policy?

✓= Largely preventable;

0= Some behavioural/preventable influences;

✗ = Not preventable (e.g. genetic).

*7. Feasibility?* Are there likely to be data (of outcome and inequality measures), and sufficient numbers?

✓= Feasible - data known to exist;

0= Less feasible - measures may be less reliable or there may be small sample sizes due to low prevalence or small studies;

× = No data expected.

*8. Expertise?* Does the project team have the expertise to research this health outcome?

✓= Expertise;

0= Could improve expertise easily;

× = Would be difficult for team to advise.

The health outcomes could receive a maximum of eight ticks; health outcomes which received seven or eight were shortlisted, along with those which received six ticks but no crosses and were a high government priority (for example they featured in a PSA target). These short listing criteria were designed to be flexible, to allow for the subjective manner in which the health outcomes were assessed. The shortlisted health outcomes were: pre-term birth, birth weight, post neo-natal mortality, breastfeeding, smoking in pregnancy, alcohol in pregnancy, overweight (including obesity), immunisation, and unintentional injuries, as shown in Figure 2.1. A spreadsheet containing the scores for each of the assessment criterion for each health outcome is provided in Appendix 2.2.

The shortlist was then discussed with the project team, taking into account the assessment criteria in more depth, and also any other arising issues. Smoking and alcohol consumption in pregnancy were excluded because they are limited to the duration of pregnancy and are therefore likely to be influenced by fewer policies (particularly policies which could be explored using secondary data); similarly birth weight and pre-term birth were excluded because the causes which are amenable to change also originate from either before or during the pregnancy period. Immunisations and overweight were not short-listed because of current or past work conducted in relation to inequalities and using data from the Millennium Cohort Study (MCS)[25;32;43;58-60]. Post neo-natal mortality was excluded because there would be insufficient numbers to explore associations and inequalities in the MCS and other social surveys, due to the low rate of infant mortality in the UK[61]. Therefore

*breastfeeding* and *unintentional injuries* remained in the final shortlist for the health case study.

**Policy**

The initial assessment criteria for the policies are outlined below. Policies, like the health outcomes, were assigned a tick (✓) if they rated positively, a zero (0) if they scored neutrally, and a cross (✗) if they scored negatively).

*1. Who is targeted?* Are mothers or children in the early years targeted?

✓= Targets young children and/or their parents;

0 = Targets all children and/or their parents, or poorer groups;

✗ = Universal.

*2. Evidence base?* Is there already a strong evidence base, or is the policy due to be evaluated (particularly in the UK)?

✓= Limited evidence;

0 = Some evidence;

✗ = Strong evidence.

*3. Longevity?* How highly does it feature on the government agenda?

✓= PSA target or similar;

0 = Highlighted as a government priority but with no target;

✗ = No priority.

*4. Policy aim?* Does the policy aim to reduce inequalities in health?

✓= Aims to reduce inequalities;

0 = Potential to reduce inequalities indirectly;

✗ = Unlikely to influence inequalities.

*5. Health affects?* What is the potential impact on health inequalities in the early years?

✓= Large impact (e.g. targeted at lower socio-economic groups);

0 = Moderate;

✗ = Low.

*6. Policy mechanism?* Are there clear pathways through which the policy might influence health and is it possible to measure them?

✓= Can measure pathways/intervening variables;

0 = Able to measure limited pathways/intervening variables;

✗ = Unable to measure pathways.

*7. Feasibility?* Are there measures to represent the policy, and what quality are the data?

✓= Feasible

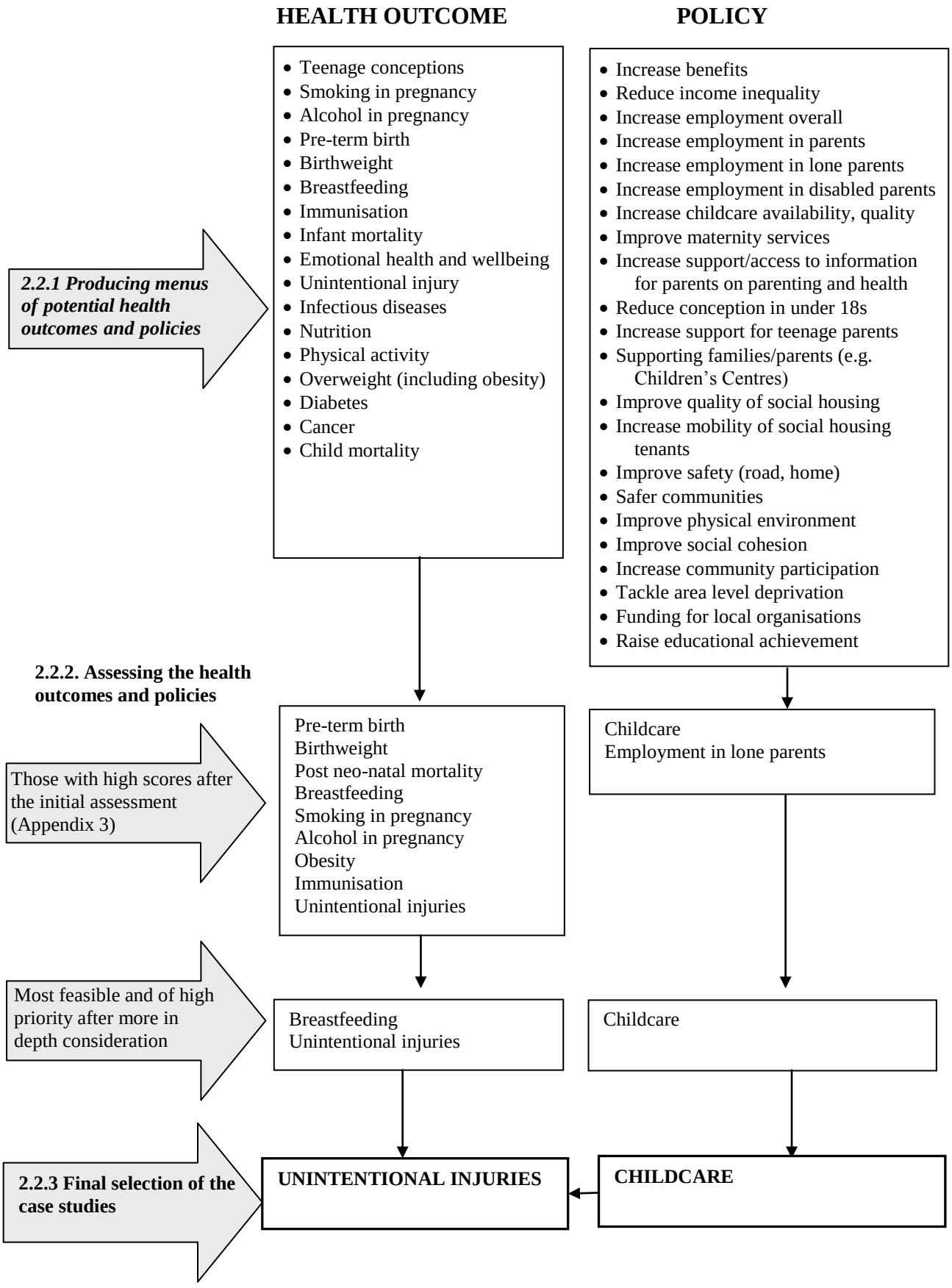
0 = Feasible but sample size likely to be small and/or measures are less reliable;

× = No data

Policies could be scored a total of seven ticks, and those which scored six or seven were shortlisted, along with those which scored five, had received no crosses, and had a PSA target (or similar). The shortlisted policies were: childcare, and employment in lone parents, as shown in Figure 2.1. A spreadsheet detailing the scores for all policies in the menu can be found in Appendix 2.2.

After further deliberation, employment in lone parents was excluded because specific programmes under this policy aim tended to target lone parents of older children[62] and so there would be less impact on children in the early years. *Childcare* remained in the final short list for the policy case study.

*Figure 2.1 – Flow diagram demonstrating the different stages for case study selection*



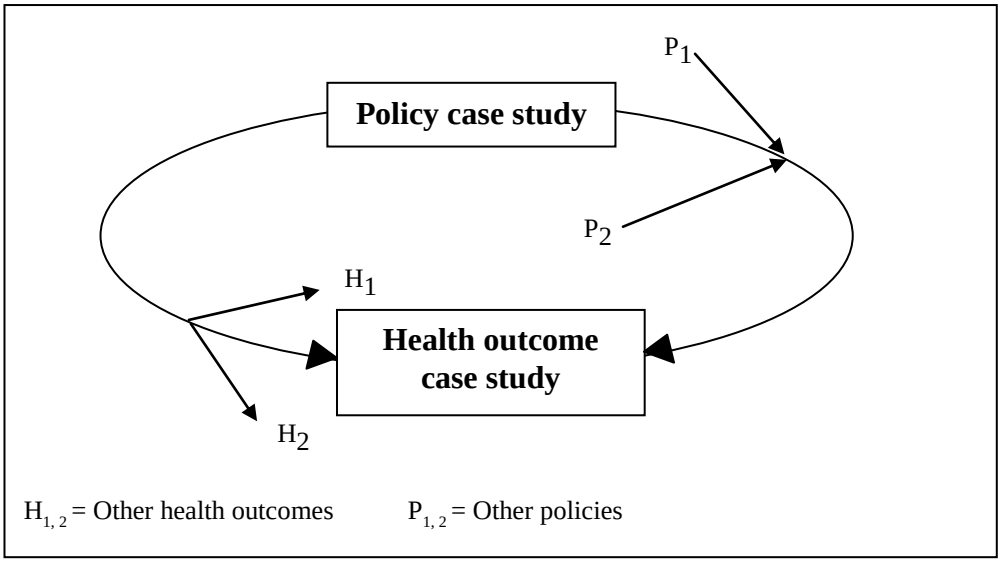
### *2.2.3 Final selection of the case studies*

Having selected childcare as the policy case study, the next step was to finalise the health outcomes case study from the shortlist of two (breastfeeding and injury). The decision was made by taking into account two further criteria: the potential for overlap between the two case studies, and availability of data to explore the links in the MCS.

**Creating an overlap between the two case studies**

The health outcomes in the final shortlist were then considered in relation to childcare (the only shortlisted policy), in order to choose case studies which were potentially linked (Figure 2.2). Creating this overlap would allow the analysis exploring the link between the policy and health outcome to sit within both sets of analyses for the case studies, potentially facilitating the synthesis of the results in Phase 3.

*Figure 2.2: Framework to demonstrate how the two case studies would overlap*




Breastfeeding and unintentional injury were both considered to be viable options for the health outcome case study, since they could both be potentially influenced by childcare use.

**Availability of relevant measures in the MCS**

In the MCS dataset, there appeared to be more policy relevant influences which could be explored in relation to injury as a case study; these included housing conditions and the use of safety equipment in the home, in addition to childcare. Whilst some important

policy areas could also be explored in relation to breastfeeding, such as maternal employment and neighbourhood characteristics, there would be some replication with other papers already published in these areas using MCS data [63-66]. Thus the two case studies selected were: unintentional injury (health outcome case study) and childcare (policy case study).

### *2.2.4 Strengths and limitations for the selection of case studies*

The two case studies were selected from a menu of relevant health outcomes and policies. The menus were compiled through conducting searches on government websites and key policy documents. It is possible that some health outcomes and policies were overlooked, although discussions were held with the project team to try and avoid this. Unavoidably, new policies have been introduced and existing policies altered since the menus were produced in 2007. Simple and iterative methods were used to assess the health outcomes and policies on the menus. Many of the criteria applied were subjective and due to time restrictions the assessment was conducted only by me (although the outcome was discussed with the project team). Therefore it is possible that different case studies would be selected if the assessment was carried out someone else. However the aim of the assessment was to ensure that the case studies selected were relevant and practicable, rather than ensuring repeatability.

## 2.3 Producing maps of review evidence for the two case studies

Having selected unintentional injury and childcare for the two case studies, the next step was to conduct a review of reviews for unintentional injury and for childcare, to identify areas requiring more or less research. This information was used to create a 'map of review evidence' for the two case studies.

### *2.3.1 Review of reviews*

In order to establish possible and known links for the two case studies, a search for reviews, editorials or commentaries (but not original research papers) that would provide overviews of any associations was conducted. In contrast to a formal systematic review, the intention was not to create a definitive picture of the existing evidence, describe findings from the reviews in detail, or to quantify effect sizes, but to help direct the focus of the secondary data analyses in Phase 2. Therefore the search for relevant papers employed scoping review methodology, which is designed to rapidly map

research activity and identify research gaps in broad areas, without seeking to answer specific research questions or assess the quality of the research [67;68]. Scoping reviews might be conducted to examine the extent, range or nature of research activity or the value of conducting a systematic review, to identify research gaps in the literature, or to summarise and disseminate research findings[67].

The "York framework" lays out recommendations for the development of the research question, identification of relevant search strategies, study selection, data extraction, and reporting results[67]. When developing the research question for a scoping review it is recommended that a broad approach is taken to maximise sensitivity. Studies should be identified through a number of different sources including electronic databases, hand searching key journals, and exploring relevant networks, organisations and conferences. The framework recommends that inclusion and exclusion criteria are developed *post hoc*, as familiarity with the literature increases. Whilst scoping reviews are designed to be quicker than systematic reviews, they can still be resource intensive[67]. Alternatives include the 'quick scoping review', which is a "Rapid Evidence Assessment" method used in the UK civil service. This type of scoping review is used to map the existing evidence on a particular topic in a short space of time (one week to two months) and focuses on reviews rather than primary studies. The information from the reviews is then used to provide a simple description of the evidence [69]. Some elements of the York framework were used in the review of reviews presented here, for example a number of different literature databases were explored containing both academic and "grey literature" (see Appendix 2.3), as well as the websites of relevant organisations; although it was not possible to hand search relevant journals as recommended in the York framework. Inclusion and exclusion criteria were developed as the abstracts and articles were read and these are described shortly. However due to time and resource limitations other elements were more akin to a 'quick scoping review', for example evidence from reviews (or commentaries) rather than primary studies was used.

The searches were not constructed to identify reviews exploring differential effects (i.e. the contribution of policies to health inequalities), as this would have reduced the number of reviews and overlooked important information about overall links. Retrieved citations that reported primary research, that did not have abstracts available online, or were not written in English were excluded (see Appendix 2.3).

Reviews were excluded from the shortlist if they focussed on certain groups, such as teenage parents or children with behavioural problems, although those which focused on certain socio-economic groups were included (usually these were in less advantaged groups), because they could help map the evidence from an inequalities perspective. Reviews concentrating on older children or where injury or childcare was not one of the main foci of the reviews were also excluded. Reviews conducted prior to 1980 were not considered due to differing policy and social contexts.

The searches have not been updated since they were first conducted in 2008, primarily because they were used to inform where secondary data analysis was most needed for Phase 2 of the project. However newly published reviews relevant to the project, which were identified via literature reviews carried out later on in the project, email alerts and colleagues, have been included. Descriptions of the searches are now set out for injury and childcare in turn.

**Injury**

Searches were conducted in the following databases in January-February 2008: PubMed, IBSS, PsychInfo, and EMBASE. ChildData, a catalogue of books, reports and journal articles, held by the National Children's Bureau (NCB) was also searched for any additional 'grey' literature. The search strategies are provided in Appendix 2.3. These returned over 3000 articles (without the identification of duplicates); papers with irrelevant titles were excluded, leaving 36 papers. Those which had accessible abstracts were read and a shortlist of 13 reviews was identified[70-82]. Two new reviews published in 2009 were added at a later date[83;84].

**Childcare**

In order to establish potential links between childcare and child health, literature searches were conducted in PubMed, IBSS, PsychInfo, EMBASE and ChildData to identify reviews, editorials and commentaries which would provide overviews of the association between childcare and health. The search strategies are provided in Appendix 2.3. These searches returned over 4000 papers (without the identification of duplicates) and papers with irrelevant titles were excluded, leaving 113 abstracts. Searches were conducted iteratively, for example, after reading the reviews it was thought that reviews exploring care by grandparents may not have been identified in the main searches. Therefore an additional search was conducted in PubMed in 2010

replacing the term "childcare" with "grandparent"; however this identified no new reviews. The 113 abstracts were read and six relevant reviews were identified[85-91]. The policy documents identified in section 2.3.1 which were relevant to childcare were also revisited and a further paper[17] was added to the six above. A new review published in 2010 was identified and retrospectively added to the shortlist [92].

### *2.3.2 Constructing maps of review evidence*

The York framework recommends that data should be charted, using a "descriptive-analytical method" that applies a common framework to collect standard information about each piece of research[67], whilst a quick scoping review uses review evidence to provide a simple description of the coverage and evidence base[69]. In this instance the findings from the review of reviews were used to produce simple maps, referred to throughout the thesis as 'maps of review evidence', because the main intention of the exercise was identify gaps in research. The main findings are briefly described in Chapters 3 (for injury) and 4 (for childcare).

Links between childhood injuries and policy areas, or between childcare and health, which were highlighted as being better researched were noted and used to create maps of review evidence. Areas which were highlighted as being under-researched in the reviews, were mentioned in the titles and abstracts of the papers excluded for being individual studies, or referred to anecdotally in the literature (i.e. in commentaries, editorials or policy documents), were also incorporated into the maps as links potentially requiring further research. The maps were then discussed with the project team to check if any potential links had been missed. Any references to the impact of policies on inequalities in injury, or childcare on inequalities in health, in the reviews were also noted. However the maps of review evidence only demonstrate the overall links, in order to help prioritise the research questions to be explored in Phase 2. An inequalities component is included in the research questions in Phase 2, which will be addressed using secondary data analysis in the MCS (Chapters 5 to 8).

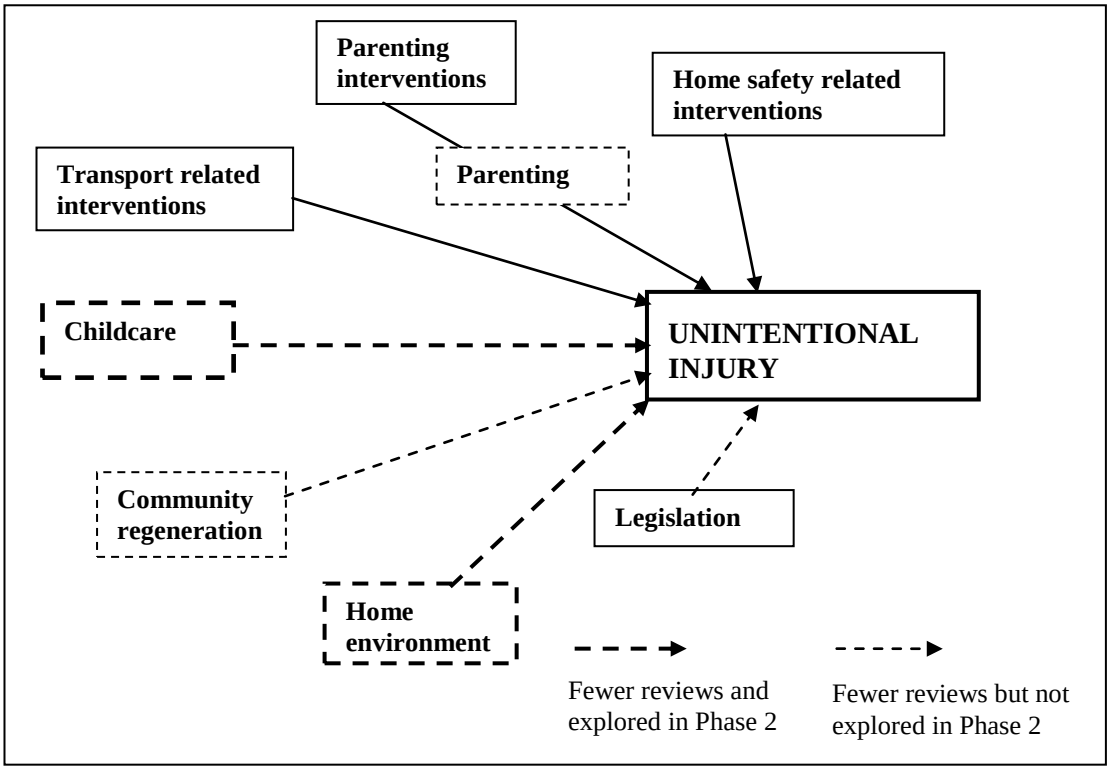
## 2.4 Choosing links in the maps to explore in Phase 2

Having created maps of review evidence for the two case studies demonstrating more and less well researched links between policies and injury, and between childcare and health, the next step was to select which links to explore using secondary data analysis. Links which were identified as being less well researched in the maps of review

evidence were considered, based on the availability of data in the MCS to assess them, and government priority (e.g. health outcomes and policy areas which were high on the government agenda were prioritised). Figures 2.3 and 2.4 are simplified versions of the unintentional injury and childcare maps, summarising the links which were identified as being more or less well researched, and those which were chosen for further analysis. These are presented here due to the iterative nature of the project. The detailed maps of review evidence are presented, along with brief summaries of the review findings, in the results section for Phase 1 in Chapters 3 and 4.

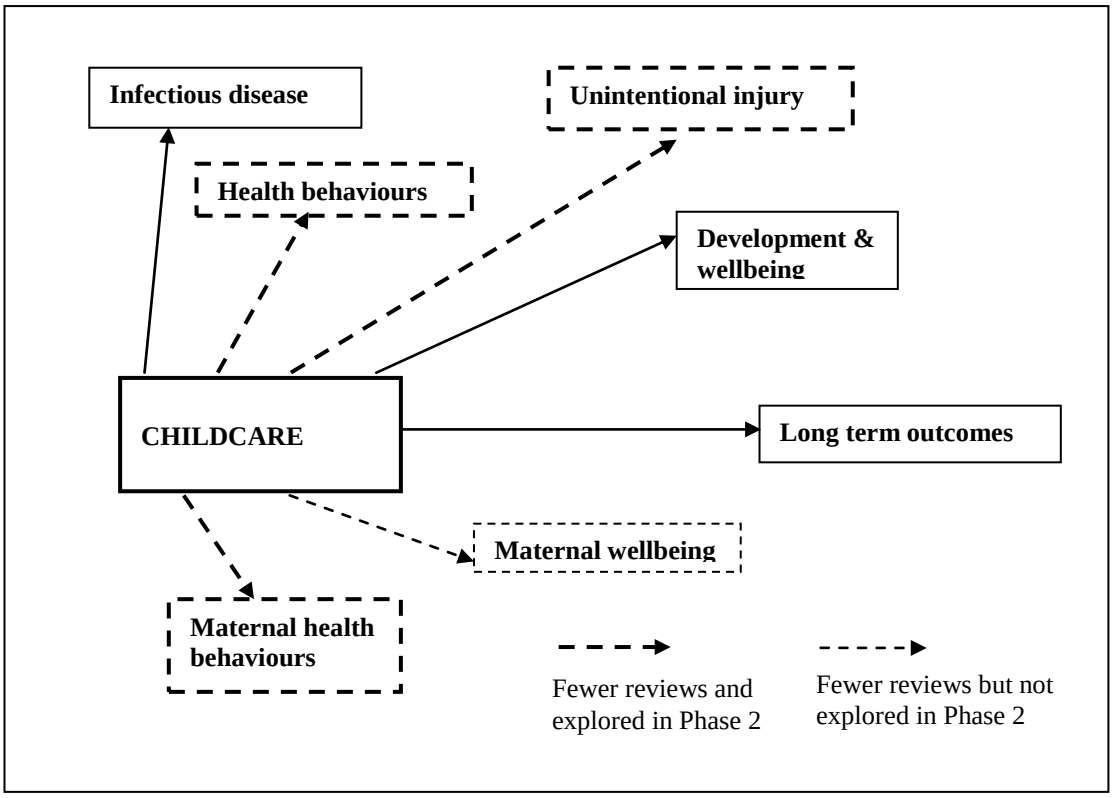
For the injury case study, links with the home environment and childcare were selected because both policy areas feature highly on the government agenda; investigating childcare in relation to injury also allowed an overlap between the two case studies. Community regeneration (e.g. improvements in social capital) was also highlighted as being less well researched, however it was thought to be of lower priority due to the limited time that preschool children spend in the local area or community (although community factors could potentially influence health indirectly, through maternal wellbeing for example).

*Figure 2.3: Simplified version of the map of review evidence demonstrating known and potential links between policies and unintentional injuries in childhood*




Breastfeeding was chosen as the first link to explore in the childcare case study, as an aspect of maternal health behaviours, since breastfeeding features highly on the government agenda and influences the health of preschool children (and was also in the shortlist for the health case study). Childhood overweight was chosen because it is an objective measure which is affected by health behaviours such diet and physical activity, and because it is a government priority to reduce levels of childhood overweight. Maternal wellbeing was also identified as being less well researched in relation to childcare use. It was not explored in this programme of work due to time limitations.

*Figure 2.4: Simplified version of the map of review evidence demonstrating known and potential links between childcare and child health*




## 2.5 Describing the two case studies

This following section outlines the methods used to describe the two case studies in Chapters 3 and 4. This comprised: describing the policy context for injury and childcare; and exploring the prevalence, trends and inequalities in injury and childcare. The additional measures featuring in the links selected for further investigation in Phase 2 (home environment, breastfeeding, overweight) are presented in Chapters 5 to 8.

### *2.5.1 Policy context*

The policy context was considered to be any policy aims, targets (e.g. PSA targets) or programmes designed to reduce injuries or in relation to childcare. Policies were considered to be relevant if they were, or had been, in place since the birth of the MCS children (from 2000), or if they were proposed for the near future. The documents identified in the searches used to compile the menu of health outcomes and in the search for policies (2.2.1), were revisited. Additional searches were conducted on government websites (DH and DCSF), and networks and electronic updates were used to monitor any changes in the policy situation for childcare or unintentional injury over the

duration of the project. Using information derived from the policy documents and updates, the policy context for unintentional injury and childcare since 2000 was summarised in writing (using descriptive rather than critical analysis techniques), and a timeline of policies was produced.

### *2.5.2 Prevalence, trends and inequalities*

The MCS was selected as the most suitable dataset for exploring contemporary policies in relation to young children's health in the UK. The following section firstly provides a background to the MCS and describes the measures used in this thesis; following this the process used to select additional datasets (to explore trends over time) is summarised, and the datasets and their measures are then described.

## Millennium Cohort Study

### Background

The MCS is the most recent of the UK cohorts, designed to examine the social, family and health-related circumstances of children born at the turn of the century (between September 2000 and August 2001 in England and Wales, and between November 2000 and January 2002 in Scotland and Northern Ireland). Due to its large sample size, over-representation of families living in deprived areas, and the broad range of information collected, the MCS was identified as being the best placed dataset for exploring the link between policies and inequalities in child health.

The sample was derived from a random sample of electoral wards which were disproportionately stratified to ensure an adequate representation of all four UK countries, deprived areas and, in the case of England, areas with high proportions of families from ethnic minority groups[93]. Survey weights are available to weight analyses, so that figures are nationally representative. Families eligible for Child Benefit and resident in England, Wales, Scotland, or Northern Ireland were invited to participate. Survey interviews were carried out by trained interviewers in the home with the main caregiver, who was usually the mother, and their partners. To date, surveys have been collected when the children were aged 9 months (first sweep), 3 years (second sweep), 5 years (third sweep), and 7 years (fourth sweep). Sweeps providing information on the preschool years (first and second) are utilised in this programme of research. Only singleton children were included in the analyses presented throughout this thesis, to

avoid clustering at the household level. The use of information provided by non-natural mothers would be inappropriate or not applicable for some analyses (such as when exploring breastfeeding) and so children were also excluded if the main respondent was not the natural mother. The datasets were obtained from the UK Data Archive, University of Essex. Ethical approval was received for the MCS from the South West and London Multi-Centre Research Ethics Committees[94]. Ethics approval was not required for the secondary data analyses conducted as part of the project, because datasets were anonymised.

**First contact**

The first sweep took place when the cohort infants were approximately aged 9 months (ranging from eight to eleven months, with 75% aged 9 months). The surveys took place between June 2001 and July 2002 in England and Wales; and between September 2001 and January 2003 in Scotland and Northern Ireland[93]. Information was collected on 72% of those approached, giving 18,819 babies, of whom 18,296 were singletons, 492 were twins and 30 triplets. Some questions were cross-sectional in nature (e.g. mother's marital status at the time of the survey) and others were retrospective (e.g. number of injuries since birth).

**Second contact**

Children who had not died or permanently emigrated were eligible to participate in the second sweep, which took place when they were approximately 3 years old (31-54 months, with 75% aged 35-37 months). Interviews were carried out between September 2003 and January 2005 in England and Wales; and between December 2003 and April 2005 in Scotland and Northern Ireland[95]. Of the original 18,296 singleton babies, 80% (14,630) participated in the second sweep. Weights are available to take into account attrition between the first and second sweeps. As with the first sweep, some of the information collected in the survey was cross-sectional (e.g. marital status) and some was retrospective (e.g. number of injuries since last survey (9 months)).

Table 2.1 presents the socio-demographic characteristics of the children at age 9 months and 3 years. Percentages were calculated using survey weights at 9 months, and survey and non-response weights at age 3 years.

**Exclusions**

Respondents who were not natural mothers (n=37 at the first sweep and 196 at the second) were excluded from all analyses, leaving a sample size of 18,259 singleton infants at age 9 months and 14 434 at age 3 years.

*Table 2.1: Socio-demographic characteristics (collected at the first contact, unless stated otherwise) of children and families at age 9 months and 3 years in the MCS: Unweighted percentages, N, Weighted percentages*

| Characteristics | *9 months* | | | *3 years* | | |
|---|---|---|---|---|---|---|
| | *Unweighted %* | *N* | *Weighted %* | *Unweighted %* | *N* | *Weighted %* |
| **Country** | | | | | | |
| England | 62.2 | 11, | 81.7 | 62.6 | 9,032 | 81.6 |
| Wales | 14.9 | 2,7 | 5.1 | 15.3 | 2,211 | 5.2 |
| Scotland | 12.6 | 2,3 | 9.4 | 12.3 | 1,774 | 9.4 |
| Northern Ireland | 10.4 | 1,8 | 3.8 | 9.8 | 1,417 | 3.8 |
| Missing (N only) | | 0 | | | 0 | |
| **Ward type** | | | | | | |
| Advantaged | 39.4 | 7,1 | 59.4 | 41.9 | 6046 | 59.5 |
| Disadvantaged | 47.6 | 8,6 | 35.2 | 46.3 | 6702 | 35.0 |
| Ethnic | 13.0 | 2,3 | 5.4 | 11.7 | 1686 | 5.5 |
| Missing (N only) | | 0 | | | 0 | |
| **Gender** | | | | | | |
| Male | 51.4 | 8,8 | 51.3 | 51.1 | 7376 | 50.9 |
| Female | 48.6 | 8,3 | 48.7 | 48.9 | 7058 | 49.1 |
| Missing (N only) | | 0 | | | 0 | |
| **NS-SEC** | | | | | | |
| Managerial & Professional | 26.3 | 4,7 | 30.2 | 28.7 | 4,087 | 30.2 |
| Intermediate | 20.5 | 3,6 | 22.4 | 21.3 | 3,033 | 22.5 |
| Routine & Manual | 42.5 | 7,6 | 40.0 | 41.0 | 5,841 | 40.2 |
| L/T unemployed/never | 10.7 | 1,9 | 7.5 | 9.1 | 1,297 | 7.1 |
| Missing (N only) | | 245 | | | 176 | |
| **Maternal education** | | | | | | |
| Degree or above | 15.7 | 2,8 | 17.8 | 17.1 | 2469 | 17.6 |
| Diploma | 8.4 | 1,5 | 9.3 | 9.1 | 1317 | 9.4 |
| A levels | 9.3 | 1,6 | 9.7 | 9.8 | 1408 | 9.7 |
| GCSE A-C | 33.5 | 6,0 | 34.6 | 33.7 | 4855 | 34.9 |
| GCSE D-G | 10.8 | 1,9 | 10.9 | 10.6 | 1524 | 11.0 |
| No qualifications | 19.5 | 3,5 | 15.5 | 17.2 | 2471 | 15.3 |
| Other qualifications | 2.9 | 528 | 2.3 | 2.5 | 359 | 2.2 |
| Missing (N only) | | 66 | | | 31 | |
| **Lone parenthood*** | | | | | | |
| Couple family | 82.8 | 15, | 85.6 | 83.7 | 12081 | 83.8 |
| Lone parent | 17.2 | 3,1 | 14.4 | 16.3 | 2353 | 16.2 |
| Missing (N only) | | 0 | | | | |
| **IMD (quintiles)^** | | | | | | |
| Least deprived | 12.3 | 1,3 | 23.3 | 15.6 | 1,447 | 22.2 |
| 4 | 13.3 | 1,5 | 19.3 | 15.1 | 1,367 | 19.0 |
| 3 | 17.1 | 1,9 | 20.6 | 18.1 | 1,637 | 20.3 |
| 2 | 21.8 | 2,4 | 18.7 | 20.8 | 1,887 | 18.3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Most deprived | 35.5 | 4,0 | 18.2 | 30.1 | 2,729 | 20.2 |
| Missing (N only) | | 2 | | | 1 | |
| **Ethnicity** | | | | | | |
| White British | 82.1 | 14, | 86.3 | 83.9 | 12,08 | 86.8 |
| Other white | 1.9 | 341 | 2.2 | 1.8 | 260 | 2.0 |
| Mixed | 1.0 | 188 | 1.0 | 0.9 | 126 | 0.9 |
| Indian | 2.6 | 473 | 1.9 | 2.5 | 365 | 1.9 |
| Pakistani or Bangladeshi | 6.9 | 1,2 | 4.2 | 6.2 | 897 | 4.2 |
| Black or Black British | 3.5 | 629 | 2.6 | 2.9 | 417 | 2.6 |
| Other | 2.1 | 381 | 1.7 | 1.8 | 252 | 1.6 |
| Missing (N only) | | 48 | | | 31 | |
| **Maternal age at first live birth** | | | | | | |
| 14-19 years | 21.0 | 3,6 | 18.5 | 19.0 | 2,665 | 18.5 |
| 20-24 years | 28.5 | 5,0 | 25.8 | 27.4 | 3,832 | 25.6 |
| 25-29 years | 27.8 | 4,8 | 29.6 | 28.9 | 4,049 | 29.7 |
| 30-34 years | 17.5 | 3,0 | 20.1 | 19.1 | 2,677 | 20.2 |
| 35-39 years | 4.7 | 831 | 5.5 | 5.1 | 720 | 5.5 |
| 40 plus years | 0.5 | 81 | 0.4 | 0.5 | 63 | 0.4 |
| Missing (N only) | | 653 | | | 428 | |
| **Family size*** | | | | | | |
| 1 child | 42.0 | 7,6 | 42.1 | 24.8 | 3,565 | 24.5 |
| 2-3 children | 49.8 | 9,0 | 50.9 | 64.7 | 9298 | 66.1 |
| 4 or more children | 8.1 | 1,4 | 7.0 | 10.6 | 1,520 | 9.4 |
| Missing (N only) | | 0 | | | 51 | |

*captured 9 months and 3 years. ^England only

Variables for injury and childcare

Variables used throughout this thesis are now described. Those marked * were created or modified by me, as detailed.

**Unintentional injury (first and second sweep)*

Mothers were asked if the cohort child had visited a doctor, health centre, or hospital due to an unintentional injury since the child was born (at the first sweep) and since the child was 9 months old (at the second sweep). Infants were classified as having been injured one or more times, or not, between birth and 9 months (first sweep), and between 9 months and 3 years of age (second sweep). At the second sweep mothers were also asked where the most severe (or only) injury occurred (e.g. home, road, playground). The questions used to create the injury variables are provided in Appendix 2.4.

**Childcare (first and second sweep)*

Mothers were asked about their main childcare arrangement and other childcare arrangements they had regularly used between the child's birth and age 9 months (at the first sweep), and between age 9 months and 3 years (at the second sweep). Childcare type was classified as "parent" if the infant was only cared for by the mother, father or the mother's partner; "informal" if they were also cared for by a friend, neighbour, grandparent or other relative, babysitter or unregistered childminder; and "formal" if they were cared for in a nursery or childcare centre, or by a registered childminder, nanny or au pair. If the main childcare type given was "parent" but an additional arrangement involved non-parental childcare, then this additional childcare type was used in order to assess any regular exposure to non-parental childcare. Where one non-parental childcare type had stopped and been replaced by another, the childcare which the child had been in for the longest duration was used. Due to the simplistic nature of this variable, it can only be considered a proxy for childcare use. A detailed description of the childcare variables and their construction is provided in Appendix 2.4.

<u>Variables used to explore the links</u>

*Home environment*

Information on several aspects of the home environment was provided by mothers, these were used, as proxy measures, to represent housing quality and safety equipment use.

*Housing quality (first sweep)*

*Rooms per capita: The number of rooms (excluding bathrooms, toilets, halls and garages) divided by number of people resident in the home.

*Building type: The Centre for Longitudinal Studies (CLS) derived a variable which classified children as living in a house or bungalow, a flat or maisonette, a studio flat, a bedsit, or other type of building. This variable was collapsed for this programme of research to include: house or bungalow; flat, maisonette, studio flat or bedsit; other.

*Storey of main living accommodation: CLS derived a variable which represented the storey that the main living accommodation was based on. This was collapsed into: ground floor; basement or above ground floor.

Access to a garden: this variable was derived by CLS and was categorised as: garden with sole use, garden with shared use, none.

*Central heating: Mothers were asked to list all types of heating that they used in their home. CLS derived variables which represented whether each type of heating was used. A variable was created, based on these variables, to identify homes which did or did not have central heating.

Damp and/or condensation: this variable was derived by CLS and was categorised as having damp or condensation on inside walls, or not.

**Safety equipment use (first sweep)*

At the first sweep mothers reported if they used any of the following safety equipment: car seat, smoke alarm, safety gate, fire guard, electric socket covers. CLS derived a binary variable for each type of safety equipment. A home safety equipment score was created which ranged from 0 (owning no safety equipment) to 3 (owning a safety gate, fire guard and electric socket covers). Car seats were not included in the score, because they would not influence injuries occurring in the home.

**Breastfeeding (first sweep)*

At the first sweep, mothers were asked if they had ever breastfed the MCS child, and if so how long they had breastfed for. This included partial and exclusive breastfeeding. A variable was created to categorise mothers who had breastfed for at least four months (>=17.4 weeks) or not, since this was the minimum duration recommended by the World Health Organization [96] and the Department of Health until 2003[97].

*Overweight (including obesity) (second sweep)*

Trained interviewers weighed (to the nearest 0.1 kilogram) the MCS children when they were age 3 years, without shoes or outdoor clothing, using Tanita HD-305 scales (Tanita UK Ltd., Middlesex, UK). Heights were measured (to the nearest 0.1cm) with the Leicester Height Measure Stadiometer (Seca Ltd., Birmingham, UK). CLS derived a variable to represent these height and weight measures; other members of the MCS Child Health Group used these measures to construct a variable to classify children as being overweight (including obesity), defined by the International Obesity Task Force (IOTF) cut-offs for body mass index (BMI)[98].

Variables representing socio-economic circumstances

Socio-economic position is a complex construct and can be represented by a number of measures; these include education (for example age left full-time education, or highest academic qualification), occupation (in the UK the most commonly used measure is the National Statistics Socio-economic Classification (NS-SEC)), household income (transformed to equivalised income to account for the number of people living in the household), and area-level measures such as the Index of Multiple Deprivation (IMD) [99;100;100;101]. In childhood, characteristics of the child's parents, household, or area can be used to represent their socio-economic circumstances (SECs), for example their parent's education, ethnicity or household income[99]. None of these indicators can encapsulate the entirety of socio-economic position and there is no recognised optimum measure[99]. Four socio-economic measures were used to represent the children's SECs for this programme of research: NS-SEC, maternal education, lone parenthood and IMD. These are described below. Other measures of SECs are also available in the MCS, such as household income or receipt of benefits; however it was not possible within the scope of this thesis to explore them all. The SECs measures used were chosen to represent the socio-economic position of the mother, the household, and also the area in which the child lived. They were chosen over alternative measures, such as family income, because they were thought to be less subject to response bias, and more widely reported on or used in targets by policy makers and also commonly explored in other research. Where it was unlikely that a measure of SECs would have changed between the first and second sweeps (e.g. education), the measure captured at the first sweep was used for all analyses, as indicated.

**National Statistics Socio-economic Classification (first sweep):*

CLS constructed a five class variable for the mother's NS-SEC: Managerial & Professional occupations, Smaller employers and own account workers, Intermediate occupations, Lower supervisory and technical occupations, Semi-routine and routine occupations, and Never worked and long term unemployed. For the purpose of this programme of research, this variable was further collapsed into the three class variable using Office for National Statistics (ONS) guidance[102]: Routine & Manual, Intermediate, and Managerial & Professional. Mothers who had never worked or were long-term unemployed were excluded from analyses focussing on inequalities by NS-SEC but were retained for all other analyses.

The partner's NS-SEC was also collected; however it was not used in this programme of research due to the high levels of missing data (at the first sweep there were 5576 (30%) missing cases, and 2416 of these were not from lone mother families).

*Maternal education (first sweep)*
Mothers reported their highest academic qualification obtained by the first sweep. CLS derived a seven category variable consisting of: No educational qualifications; GCSE D-G; GCSE A-C; A or AS Levels; Diploma in higher education; Degree; Other. Mothers who had 'other' qualifications were excluded from analyses focussing on inequalities by maternal education; they were retained for all other analyses.

**Lone motherhood status (first and second sweep)*
CLS constructed a variable to describe whether the household was lone parenthood household at the first sweep. A similar variable was constructed, by me, at the second sweep to allow for any changes in status since the last sweep.

**Index of Multiple Deprivation (first and second sweep)*
The Index of Multiple Deprivation (IMD) 2004 was linked into the MCS dataset by CLS using the children's postcodes, measured at the Super Output Area (SOA) level, a unit based on the 2001 Census containing an average of 1,500 people[103]. Every SOA in England is ranked from 1 (most deprived) to 32 482 (least deprived). The cohort children were classified, using their home postcode at the first and second sweeps, according to the national deciles. For this programme of research, the variable was further collapse into quintiles. Because area deprivation measures for Wales, Scotland, and Northern Ireland are not directly comparable to the English rankings, children living in Wales, Scotland and Northern Ireland were excluded from analyses which focussed on inequalities according to IMD.

**Selection of other national datasets**

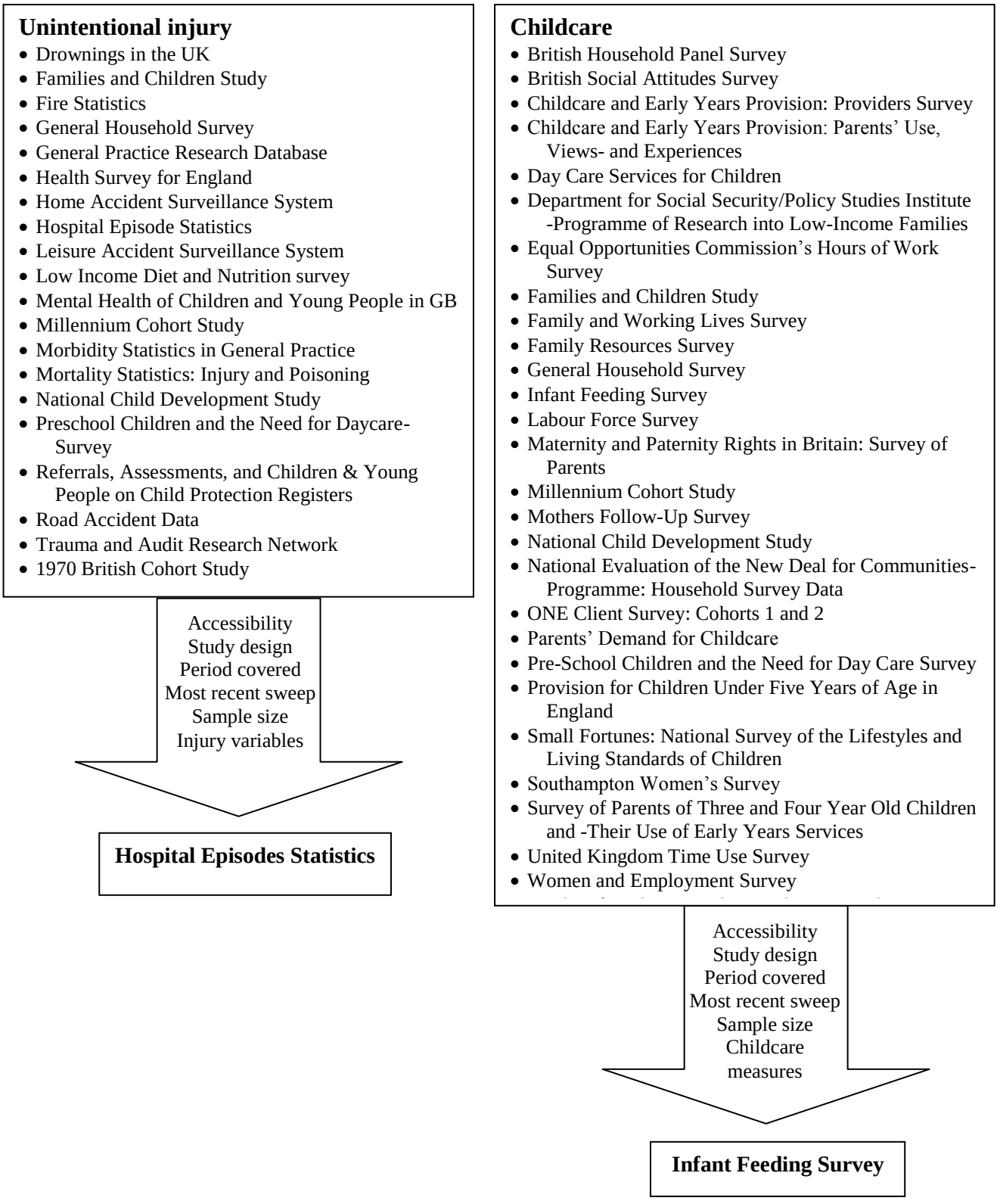
The MCS provides injury and childcare information between birth and 9 months (in 2000-02) and between 9 months and 3 years (2003-05), and inequalities in these according to a number of SECs measures described previously. A scope of national datasets (covering England or the UK) was conducted to identify nationwide datasets that could be used to estimate recent prevalence (i.e. as up to date as possible) and trends in injury and childcare, information required to understand the context when conducting the synthesis and which the MCS (as a cohort study) could not provide. The datasets were then assessed for relevance and feasibility. The scope and assessment for

datasets is now described below, first for injury and childcare, and then for the remaining measures in the links (home environment, breastfeeding and overweight).

*Dataset with information on Injury and Childcare*

Searches were conducted in PubMed, the Office for National Statistics, The UK Data Archive, Public Health Observatories (PHO) identified as specialising in injuries or child health, and other relevant websites such as the Day Care Trust and the Royal Society for the Prevention of Accidents (RoSPA). Search terms differed according to the source being searched, but included variations of the terms for unintentional injury (e.g. accident, wound) and childcare (e.g. daycare); search terms were also used to limit the returns to England- or UK-wide studies. A total of twenty datasets were identified with the potential to explore unintentional injuries in children (including the MCS) and thirty-three were identified for childcare (again including the MCS). A list of these datasets is provided in Figure 2.5.

*Figure 2.5: Flow diagram to demonstrate the datasets identified for injury and childcare in the searches, assessment criteria and final selection*



The datasets were then assessed according to a set of criteria designed to identify the most suitable datasets. These criteria have been used in previous projects[46], and are shown in the arrows in Figure 2.5. They include accessibility (The Yorkshire and Humber Public Health Observatory (YHPHO) had special access to a number of datasets over and above those which are publicly available, therefore datasets which they did not have access to were excluded due to time and resource), study design (for example cohorts cannot provide trends), and the nature of relevant measures (some injury datasets only collected information on certain types of injury and some childcare datasets only explored early years education). The most suitable datasets for describing recent prevalence or trends, according to these criteria, were: Hospital Episode Statistics (HES) for injuries, and the Infant Feeding Survey (IFS) for childcare. Occasionally these national datasets also contained relevant information to assess inequalities in injury and childcare, however since this was not always consistently the case, and because the data often carried limitations, this information is not presented in this thesis.

*Datasets containing information relevant to the remaining measures in the links*

A search for datasets with the potential to describe current prevalence and trends in the remaining measures featuring in the links identified for further exploration in Phase 2 was also conducted.

Searches for datasets holding information on the home environment (including aspects of housing quality and safety equipment use) were conducted on the Association of Public Health Observatory (APHO) website, the UK Data Archive, the Office for National Statistics website, and the Communities and Local Government website, using terms such as home environment, safety equipment, and housing. Fourteen datasets were identified and assessed using similar criteria to those used for the injury and childcare datasets (sample size, period for which data were collected etc). The most suitable datasets were: The English House Conditions Survey (EHCS), and The General Household Survey (GHS).

Datasets collecting information on breastfeeding and childhood overweight had been identified in previous work[46;104]. For breastfeeding, the most suitable dataset was the IFS, and for overweight, the Health Survey for England (HSE).

**Description of the national datasets and variables**

The datasets selected to explore prevalence and trends are now described.

*English House Conditions Survey*

The EHCS is designed to provide information on the condition and energy efficiency of housing in England. It was collected quinquennially from 1967, and then continuously from 2002 until April 2008, when it was merged with the Survey of English Housing to form the English Housing Survey (EHS). It collects information on build type, central heating, smoke alarm ownership, and rooms per capita. YHPHO accessed and cleaned the data and created variables using the same categories used for the MCS data. Data from 1987 to 2006, on approximately 3000 households with preschool children (0-4 years), were used.

*General Household Survey*

The GHS is a cross-sectional survey which collects information on a range of topics from people living in private households in Great Britain. The survey started in 1971 and has been carried out continuously since then. The last sweep of data available at the time this project was conducted was 2006. The survey collects information on the home environment including build type, storey, central heating and rooms per capita. Data on housing conditions in 2000 and 2006 for approximately 1000 households with preschool children (0-4 years) were used. YHPHO accessed and cleaned the data and constructed measures using the same categories used with the MCS variables.

*Health Survey for England*

The HSE is a cross-sectional survey about the health of people living in England, designed to provide better and more reliable information about various aspects of people's health and to monitor selected health targets. It has been carried out annually since 1991. Information on overweight and obesity is available since 2000 and at the time of this project, up until 2007. The number of preschool children with height and weight data ranged from approximately 400 in 2000 to 1600 in 2007. YHPHO were able to access the 2000 and 2005 datasets through the Information Centre Data, which were collapsed into 2-3 and 4-5 year age groups, for comparability with MCS. International Obesity Task Force (IOTF) cut-offs were used to classify children as normal weight, overweight, or obese.

*Hospital Episode Statistics*

HES is a records-based system of hospital episodes covering all NHS trusts in England, which has been collected continuously from 1987. Data pertaining to unintentional injuries were identified by the Yorkshire and Humberside Public Health Observatory (YHPHO) using International Classification of Diseases (ICD) codes (primary diagnosis ICD10 codes in the range S00 to T98X, and external cause codes in the following ranges: V01-V99, W00-X59, Y40-Y84) in England according to Hospital Episodes Statistics (HES). These data exclude injuries from maltreatment, but include undetermined injuries. Inpatient data were available on injuries which had occurred to approximately 35,000 children aged under three years each year between 1997 and 2008 (range 34,000-38,000). Data were collapsed for infants aged <one year and for children aged one-three years, for comparability with the MCS.

*Infant Feeding Survey*

The IFS is a cross-sectional survey designed to measure the incidence, prevalence and duration of breastfeeding of babies during the first few months of life. It has been conducted every five years in England and Wales since 1975, and was extended to Scotland in 1980 and Northern Ireland in 1990. Data were collected when children are aged six-eight weeks, four-five months and nine-ten months. Since 2000, mothers who were in paid employment were asked about any childcare that they used when the child was nine months old; multiple responses were allowed, in no order of priority. YHPHO gained access to the 2000 and 2005 datasets through the Information Centre, and created a measure which demonstrated the proportion of childcare responses which fell into the categories of informal and formal childcare (using the same classification used in the MCS). Approximately 4800 childcare responses were provided by 3500 mothers in 2000, and 6200 responses by 4200 mothers in 2005.

**Methods for assessing inequalities**

As outlined previously, the socio-economic measures identified to represent SECs are: NS-SEC, maternal education, lone parenthood status and area deprivation (IMD). There are several approaches for quantifying differences in prevalence or risk between different socio-economic groups; these are now described.

Graham has described three main approaches to describing and tackling socio-economic inequalities[105]. The first approach defines health inequalities as health disadvantage. Poor health is experienced as a result of social disadvantage and this approach aims to

lift the poorest groups out of disadvantage. The second approach involves narrowing health gaps, focussing not only on the health of poorest groups but also on their health in relation to other groups (either higher socio-economic groups or the population average). It aims for absolute improvements in health of the lowest socio-economic groups, but also requires a rate of improvement which outstrips those from higher socio-economic groups. The final approach, reducing health gradients, takes this one step further. It focuses on health across all groups, since health inequalities are not only experienced by individuals at the very bottom of the social hierarchy. All three approaches refer to a 'levelling up' of health; a narrowing of inequalities which results from a decline in health in more advantaged groups is not considered to be appropriate.

There are several ways in which inequalities between different groups can be quantified; these broadly fall under indicators of relative and absolute inequality. The risk ratio (the relative difference between risk or prevalence between two groups) has some limitations, including its inability to take into account the proportion of the population falling into the different socio-economic strata being compared, or to account for differences across the gradient in one summary measure (unlike its more complex counterparts, such as the relative concentration index [106]). However it is the most commonly used relative measure and is also easily interpreted[106]. The absolute difference (the difference between prevalence or risk between two different groups) has similar limitations as the risk ratio but is also easily understood and commonly used. Both measures were used to monitor progress towards the infant mortality and life expectancy targets inequalities laid out in the Programme for Action[4].

It has been highlighted that the relative difference is a more sensitive measure of inequality than the absolute difference, in populations where the risk is relatively low. In these situations the relative difference can be a better measure for judging the magnitude of inequalities; large relative differences may not be considered as significant if the condition is rare (and the absolute difference therefore small) than situations where the relative difference is smaller but in a more common condition (where the absolute difference would be larger) [107]. For example as UK mortality rates declined dramatically in the 20$^{th}$ century, absolute inequalities also narrowed[101], whilst relative inequalities have increased. It has therefore been argued that it is important to explore both relative and absolute differences[107].

In this thesis data are presented for all groups in each of the SECs measures, using relative and absolute difference to compare groups, with the most advantaged group as the reference. Throughout the thesis, the terms "relative difference" and "absolute difference" will be used when describing socio-economic inequalities.

**Statistical analysis for Phase 1**

The analyses for estimating prevalence and inequalities in the MCS were conducted in STATA/SE 10.0 (Stata Corporation, TX), using survey commands to allow for the sampling design and loss to follow up. Weighted percentages were calculated to estimate prevalence, and Poisson regression was used to estimate relative differences (RDs) using the formula: $\%_1$ / $\%_2$ (with 95% confidence intervals (CIs)). Absolute differences (ADs) ($\%_1$ - $\%_{2)}$ and standard errors were estimated using the "estat lceffects" command in STATA[108] (page 38) and then 95% confidence intervals were calculated using the standard errors, in Excel. Because RDs and ADs were calculated using prevalence (%), tables presenting inequalities show the proportion of children in each type of childcare (informal, formal, parent only) with a baseline *all* children.

The data from the national surveys were provided by YHPHO (or the Information Centre, via YHPHO), in the form of percentages (weighted where applicable) and in Excel spreadsheets. Line graphs were used to visually demonstrate trends, using the raw data (rather than a line of best for example). Graphs were used to represent prevalence and trends and these were created by me, in Excel.

# Methods for Phase 2

## 2.6 Objectives

- To explore how policies might influence inequalities in health, using the examples of injury and childcare, and utilising data from the Millennium Cohort Study (MCS) (2.7)

## 2.7 Approaches used to explore the impact of policies on health inequalities

A conceptual framework has been developed by Whitehead and colleagues, for studying the health impacts of social position and social context[44]. In the framework, policies can influence health inequalities at three different "entry points". Whitehead and colleagues use this framework to explore how social policies might influence the heath of lone mothers at the different entry points, comparing data and policy contexts in Britain and

Sweden over time[44]. At the first entry point, policies can alter socio-economic position (to quote the example used by Whitehead and colleagues, lone parenthood might be influenced through family planning policies, abortion and adoption laws and divorce laws). At the second entry point, policies can reduce the consequences of socio-economic position (for example through reducing poverty in lone parents via social security benefits and childcare provision to enable lone mothers to enter paid employment). Finally, at the third entry point, policies might soften or exacerbate the impact of the consequences of socio-economic position on health (for example the impact of being poor may be different for lone mothers compared to those living as a couple).

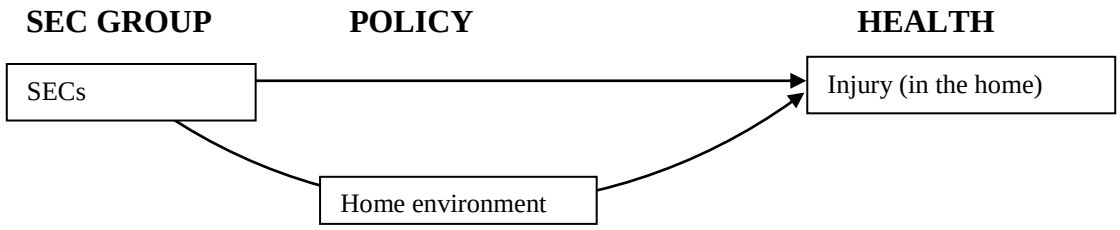
This programme of work uses a case study approach to explore how policies might influence inequalities in health and focuses only on certain links which were identified as being less researched and high on the policy agenda. Therefore it was not possible to explore all three of the entry points. The analyses exploring the links (in Phase 2) focus on how policies might influence the impact on the consequences of socio-economic circumstances on inequalities in health (the third entry level). This is carried out using two different approaches, demonstrated in Figure 2.6. The first approach investigates whether a policy exposure mediates the association between SECs and health. The second approach comprised exploring the overall association between a policy and a health outcome, and then investigating the association in different SECs groups.

In this thesis the first approach is used to explore the impact that improvements to the home environment might have on inequalities in unintentional injury (Chapter 5), for two reasons. Firstly because it has been hypothesised that the home environment may be a factor on the causal pathway between SECs and injury in children[77;109], and secondly, because improving the home environment was the focus of several government policies as a strategy to reduce inequalities in health and welfare and to prevent childhood injuries. The second approach was employed for all of the analyses exploring childcare (in relation to unintentional injury in Chapter 6, breastfeeding in Chapter 7, and overweight in Chapter 8). This was because it is plausible that the impact of childcare on health might vary according to SECs, for example due to variations in the quality of childcare experienced by different groups because of affordability or accessibility. Due to the a-priori hypothesis that the association between childcare and health might vary by SECs, interaction terms (or effect modification) were not sought for as a prerequisite

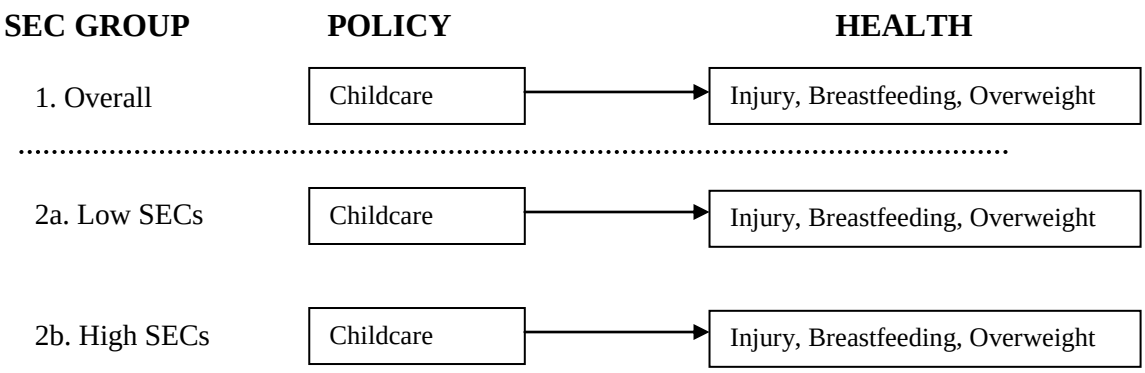
to stratification. This allows the identification of associations in different strata but between-strata comparisons of the associations or risk ratios are not possible.

*Figure 2.6: The two approaches used for exploring the impact of policies on inequalities in health*

*Approach 1) the home environment as a factor on the causal pathway between SECs and injury*




*Approach 2) exploring the association between the policy and health outcomes overall and by SECs*




## 2.8 Statistical analysis

As with the MCS analyses in Phase 1, the analyses exploring the links in Phase 2 were carried out in STATA/SE 10.0 (Stata Corporation, Texas) using survey commands to allow for the sampling design and loss to follow up. Analyses which only include data from the first sweep exclude children where the main respondent was not natural mothers (n=37), leaving 18,259 singleton infants at age 9 months. For analyses exploring data at the first and second sweeps, children are included only if they had taken part in both sweeps (no analyses are conducted using only data from the second

sweep). Children are excluded if the main respondent was not the natural mother (n=196), leaving a sample size of 14,434.

Poisson regression is used to estimate unadjusted and adjusted risk ratios (RRs) and 95% confidence intervals (CIs). The decision was made to use risk ratios for exploring the links, rather than odds ratios, because they are more easily interpreted and are the recommended measure for use with data where the baseline is known (whereas logistic regression is suitable for case control designs)[110;111]. As stated earlier, relative differences (RDs) are used to explore inequalities. RDs and RRs are technically the same measure, however they are referred to with different terms to help distinguish between analyses exploring inequalities (RDs), and those exploring the associations between policies and health (RRs). Through using RRs to explore the impacts of policies on inequalities in health, the focus is limited to social patterning rather than the size of the burden. The size of the burden is considered (but not quantified) in the synthesis (Chapter 10).

Confounders are factors which are associated with both the exposure and outcome being explored and can lead to a bias in results. Potential confounding factors were identified for this work through the literature and discussion with the project team. A number of potential confounding factors, common to all analyses, were adjusted for in all chapters. These measures were considered to be potential confounders because they were related to both the exposures (SECs and childcare) and the outcomes (injury, breastfeeding and overweight) explored in each of the analyses presented in Chapters 5-8:

*Maternal age at first live birth*: Children of younger mothers were more likely to come from less advantaged backgrounds than those with older mothers. They were more also likely to have been injured (at both sweeps and also in the home). They were less likely to be looked after in formal childcare between birth and 9 months and between 9 months and 3 years than those with older mothers, and more likely to be looked after only by a parent (although this was not statistically significant at the second sweep). Younger mothers were also less likely to breastfeed for at least 4 months than older mothers and their MCS children tended to have higher rates of overweight at age 3 years.

*Number of children in the household (or parity in the case of breastfeeding)*: Children who were living in larger families tended to come from less advantaged socio-economic backgrounds than those living in smaller families. Children who were not living with any other children were more likely to be injured at both time points (and at home) (compared to those living with other children) and those from smaller families were more likely to be overweight at age 3. Those from smaller families were more likely to be looked after in formal and informal childcare and they were also more likely to be overweight. Parity was explored in place of number of children in the household when exploring breastfeeding and mothers who had experienced just one, or four or more, live births were less likely to be breastfed for at least 4 months than those with two to three.

*Ethnicity*: Children from mixed, Black Bangladeshi or Pakistani backgrounds were more likely to live in deprived areas than those with White or Indian mothers. Over one third of mixed race or Black British mothers were lone parents whereas rates were under 10% for Indian, Pakistani or Bangladeshi and other White mothers. Children of White British mothers were the most likely to be injured between birth and 9 months and 9 months and 3 years, whereas those from Indian and Other ethnic groups were the least likely to have been injured. Those with White British and Mixed ethnicity mothers were the most likely to have been injured in the home and those with Indian mothers were the least likely. Breastfeeding rates were considerably lower in White British mothers compared to other ethnic groups, whilst rates of overweight were highest the Mixed and Black/Black British groups. Childcare use varied by ethnicity across both periods; mothers from the 'other White' group were the least likely to use informal childcare and the most likely to use formal childcare, and Pakistani/Bangladeshi families were the most likely to use parental only care and the least likely to use formal childcare.

These associations are presented in detail in Appendix 2.5. Other potential confounders were considered for each analysis individually and are discussed in the relevant chapters. Confounders were adjusted for in all stratified analyses for consistency (regardless of whether they confounded the association in particular stratum). Mothers who were long term unemployed or had never worked were excluded from the analyses stratified by NS-SEC but were included in all other analyses. Similarly, mothers who had 'other' qualifications, such as qualifications from overseas, were excluded from the analyses stratified by maternal education but included in all other analyses.

Details specific to each of the links are outlined in the relevant chapters (5 to 8).

## Methods for Phase 3

### 2.9 Objectives

- To synthesis the findings from Phases 1 and 2 in light of current and future policy.

### 2.10 Synthesis methods

Evidence synthesis is a relatively new science, and methodologies and frameworks for researchers are evolving [112]. A framework has been developed for synthesising evidence from a range of sources including qualitative and observational research, using similar methods to a systematic review[113]. This enables findings to be reproducible and minimises researcher bias, whilst allowing questions beyond effect size to be asked, such as views regarding interventions and explanations for their effects[113]. However it has been pointed out that using such rigorous methods for synthesising information means that policy makers may not be able to understand how the findings were generated[112]. Alternatively, findings from a number of sources can be synthesised in a more narrative manner as seen in two studies seeking to explore the impact of policies in lone parents in Britain and Sweden[44] and how various policies might contribute to the eradication of child poverty[6]. It might be argued that narrative syntheses are better suited to situations where existing research is scarce (and therefore reviews are not possible) and therefore different pieces of information are taken from a range of sources and used to create a "jigsaw of evidence"[41]. Whilst less reproducible, this technique is flexible and more easily understood by policy makers.

A narrative synthesis is used, in Chapter 10, to interpret findings presented throughout the project in light of current and future policy. Firstly the findings (or 'jigsaw pieces') presented throughout the thesis are brought together:

**Phase 1**

- Current and potential policy context for unintentional injury and childcare (review of policy documents, Chapters 3 and 4)
- Overall associations between policies and injury and between childcare and health (review of reviews, Chapters 3 and 4)

- Prevalence in injury and childcare (MCS, Chapters 3 and 4)
- Inequalities in injury and childcare (MCS, Chapters 3 and 4)

**Phase 2**

- Prevalence in home environment, breastfeeding and overweight (national datasets, Chapters 5, 7, 8)
- Inequalities in home environment, breastfeeding and overweight (MCS, Chapters 5, 7, 8)
- Associations between policies and health inequalities (MCS, Chapters 5 to 8)

Following this the results are interpreted, using a narrative approach, in light of current and future policy making, where:

- Current policy is taken to be policies experienced by the MCS families in 2000-05
- Future policy is changes which have occurred since then
- Potential changes under the new Conservative- Liberal Democrat coalition, which came into power in May 2010, are also briefly considered

## Summary of methods for Phases 1 to 3

This chapter has described the methods used in the three phases of the project.

- In Phase 1 the two case studies were identified (injury and childcare). A review of reviews was conducted to map where more and less research had been conducted and links to explore in more depth in Phase 2 were identified. Contextual information such as the policy context, trends and inequalities in injury and childcare are explored using data from the MCS and other national datasets. The maps of review evidence and the contextual information are presented in Chapters 3 (for injury) and 4 (for childcare).
- In Phase 2 the links between policies and health identified as requiring further research in the maps of review evidence (Phase 1) are explored, using data from the Millennium Cohort Study. Two approaches are used to investigate the association between policies and health inequalities. The first explores the association between socio-economic circumstances and health, and whether the

policy might mediate this association. This approach is used to explore the home environment in relation to inequalities in injuries in Chapter 5. The second approach explores whether the association between a policy and health varies in different social groups. This approach is used for the analyses investigating childcare in relation to injury, breastfeeding, and overweight in Chapters 6-8.

- In Phase 3 the results from the first two phases are synthesised in light of current and future policy, using a narrative approach.

# 3 Chapter 3 – Unintentional injury: policy context, trends and inequalities, and potential policy influences

This chapter consists of a detailed background for the unintentional injury case study. Firstly a description of the policy context, trends and inequalities in unintentional injury is provided. Following this, the main findings from the review of reviews are summarised and a map of review evidence is produced to indicate how policies might influence injuries in childhood and highlight areas which are less researched.

## 3.1 Objectives

- To describe unintentional injury in terms of:
- General background (3.2.1)
- The policy context (3.2.2)
- Trends and prevalence in the national datasets (3.2.3)
- Prevalence and inequalities in the MCS (3.2.4)
- To conduct a review of reviews and to produce a map of review evidence exploring how policies might influence injuries (3.3)

## 3.2 Description of unintentional injury case study

### *3.2.1 Unintentional injury: general background*

Unintentional injury is the main cause of death and morbidity in childhood in the UK. In England in 2004/5 there were almost 120,000 admissions to hospitals in 0-14 year olds, and approximately 2 million visits to accident and emergency departments (A&E), due to unintentional injury in children. The estimated cost to the NHS was £146 million[114], and these figures do not include children who were treated by family doctors or at home, or indirect costs such as the burden on family and carers from, for example, absence from work[114]. Injury is one of the most socially distributed causes of ill health and disability in children[115]. Children aged 0-15 years whose parents have never worked or who are long-term unemployed are 13 times more likely to die from unintentional injury, and 37 times more likely to die as a result of exposure to smoke, fire and flames, compared to children whose parents are in higher managerial and professional occupations[114]. A study of hospital admissions in the Trent region, UK, found that the socio-economic gradient in injuries was more marked in preschool than older children[116].

### *3.2.2 Unintentional injury policy context*

The policy context for unintentional injuries in the UK, which was derived using descriptive rather than analytical techniques, is now summarised. Childhood injuries first featured highly on the Labour administration's political agenda in 1999 when the White Paper "Saving Lives: Our Healthier Nation" was launched[2]. The report highlighted unintentional injury as the greatest single threat to children's lives and set two targets to reduce deaths and serious injuries from accidents, although neither focussed on children. In 2001 the prevention of unintentional injury in the home and on the road was identified as an important intervention to help reduce inequalities in life expectancy[117]. Two years later the "Programme for Action" produced national headline indicators to monitor progress towards the target and these included road accident casualties (with children monitored as a separate group) and the proportion of households living in non-decent housing[4]. The first cross-government strategy for improving children and young people's safety "Staying safe: action plan" was published in 2008[118], spanning the breadth of the Every child matters 'stay safe' outcome: keeping children safe from neglect and abuse, accidents, bullying, crime and antisocial behaviour and providing a safe and stable home environment[7]. This would be implemented on three levels: universal safeguarding (working to keep all children safe); targeted safeguarding (focussing policies and services to those groups of children who are at greater risk); and responsive safeguarding (responding quickly and appropriately when children suffer harm). The action plan was accompanied by Public Service Agreement (PSA) indicators to improve children and young people's safety and four indicators were identified to monitor this target: bullying, initial assessments after referral to social care, preventable child deaths, and hospital admissions from unintentional and deliberate injuries.

Government commitments to reduce hospital admissions from injuries included the communication of home safety messages targeted at disadvantaged families as part of a broader communication campaign, a new home safety equipment scheme to provide low cost or free home safety equipment and home safety consultations to disadvantaged families, continued investment to make social sector housing safer and to reduce overcrowding, and the promotion of fire safety messages[118]. In 2009, a local area priority review was carried out in order to make further recommendations about how accident prevention might be improved. The review raised safety within the home as a priority, alongside fire, water and road safety. It also emphasised the importance of the

early years for injury prevention, highlighting the Early Years Foundation Stage and Children's Centres as vehicles for the promotion of injury prevention[119].

Figure 3.1 demonstrates when these policies came into effect in relation to when the MCS children were born and when relevant sweeps of MCS data collection were carried out. The majority of these policies were implemented after the MCS children were in their preschool years (the period during which their risk of injury has been investigated in this project).

### *3.2.3 Trends in unintentional injury*

Although there has been an overall decrease in childhood injury rates and death rates from injury over the past decade, rates remain high. Trends focussing only on injuries in preschool children are not often reported. Figure 3.2 presents the number of infants (<one year) and young children (one-three years) who were admitted to hospital with an unintentional injury. These data exclude injuries from maltreatment, but include undetermined injuries. Mid year (30th June) population estimates from the Office for National Statistics (ONS) were used to estimate the baseline population for the HES data, which refer to fiscal years (1st April to March 31st). The data imply that between 1997/98 and 2007/08 the proportion of infants who were injured increased from 1.15% to 1.44%. In contrast, rates in one-three year olds decreased slightly from 1.63% to 1.53%.

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*Figure 3.1: Timeline to demonstrate when policies relevant to childhood injury were introduced, in relation to the Millennium Cohort sweeps*

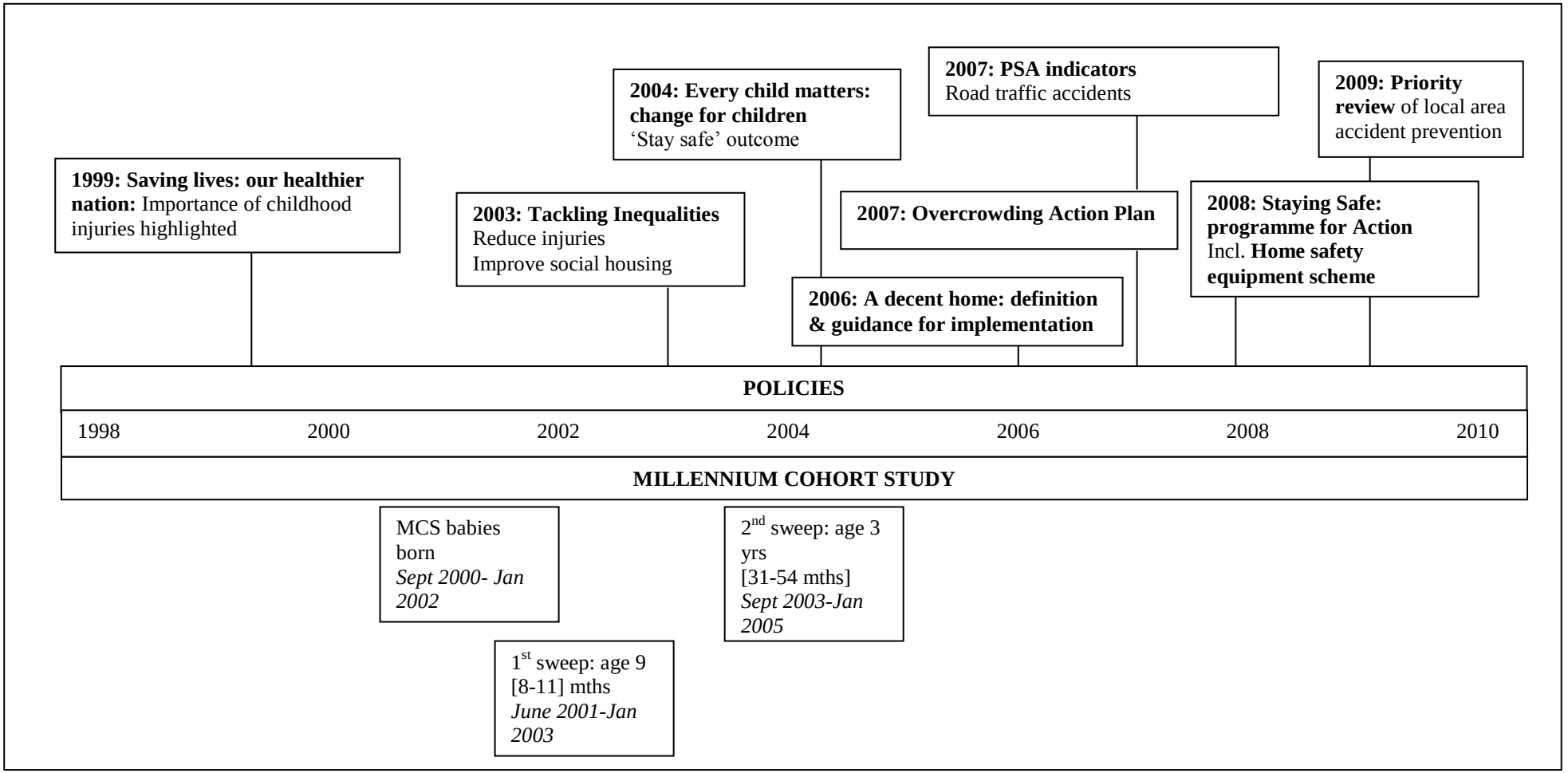
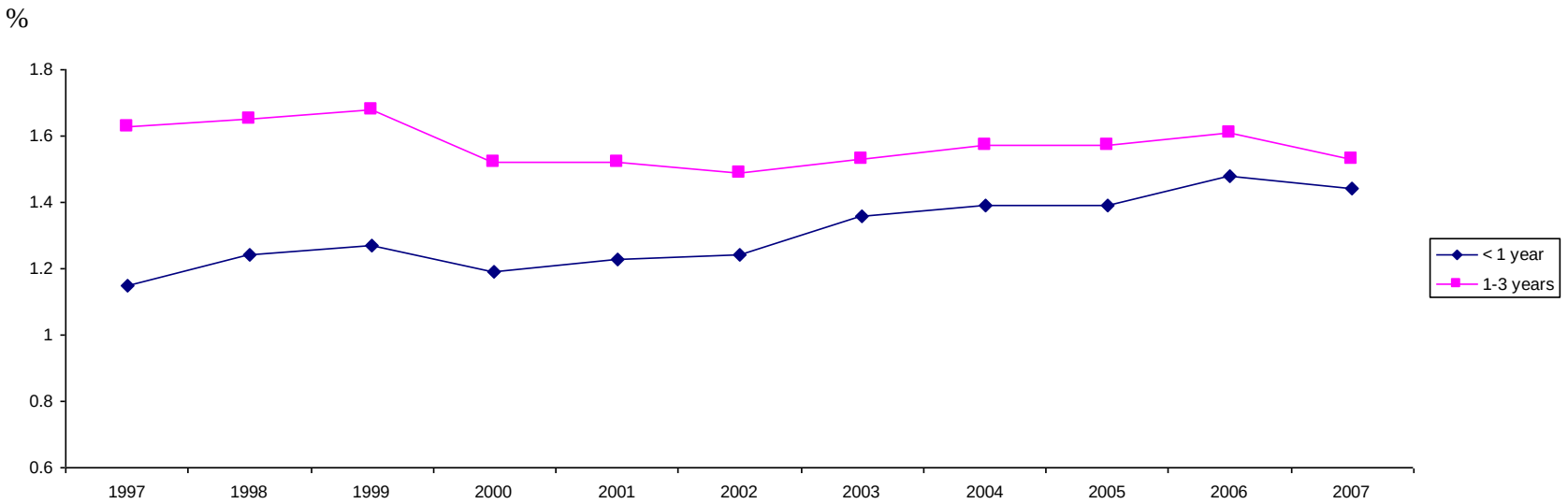


*Figure 3.2: Percentage of infants (<1 year) and young children (1-3 years) admitted to hospital due to an injury, 1997-2007, Hospital Episode Statistics, England*




| | Age (yrs) | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mid-year population estimates | *<1* | 614000 | 597700 | 592200 | 575000 | 557500 | 558300 | 575700 | 597300 | 606500 | 620100 | 641000 |
| | *1 to 3* | 1841600 | 1825900 | 1816300 | 1799600 | 1754900 | 1715000 | 1686800 | 1689000 | 1730600 | 1776800 | 1822600 |
| Children injured (N) | *<1* | 7088 | 7415 | 7538 | 6847 | 6882 | 6920 | 7828 | 8316 | 8456 | 9190 | 9253 |
| | *1 to 3* | 29968 | 30109 | 30517 | 27321 | 26721 | 25493 | 25798 | 26539 | 27224 | 28526 | 27864 |
| Children injured (%) | *<1* | 1.15 | 1.24 | 1.27 | 1.19 | 1.23 | 1.24 | 1.36 | 1.39 | 1.39 | 1.48 | 1.44 |
| | *1 to 3* | 1.63 | 1.65 | 1.68 | 1.52 | 1.52 | 1.49 | 1.53 | 1.57 | 1.57 | 1.61 | 1.53 |

### *3.2.4 Prevalence and inequalities in unintentional injury, in the MCS*

In the MCS 8.1% of infants (aged 9 months) had been taken to a doctor, health centre, or hospital for an unintentional injury (based on maternal report) since birth. By age 3 years, 35.6% had attended a doctor, health centre, or hospital for an unintentional injury since the previous survey at age 9 months (Table 3.1). The higher percentage by age 3 years is in part due to the longer period to which the question referred, and also the higher rates of injury typically observed in this older age group[120]. The large majority of these injuries did not require admittance to a ward and therefore these figures are not comparable to the data from HES.

*Table 3.1: Children at least once between birth and 9 months, and 9 months and 3 years in the MCS: weighted % (N)*

| **Injured?** | **Birth - 9 months** | **9 months – 3 years** |
|---|---|---|
| | *% (N) injured* | *% (N) injured* |
| No | 91.9 (16794) | 64.4 (9270) |
| Yes | 8.1 (1443) | 35.6 (5108) |
| *Hospitalised* | *6.6(95)* | *6.5(330)* |
| Total | 18,237 | 14,378 |
| Missing | 22 | 56 |

Table 3.2 presents inequalities in unintentional injuries occurring to MCS children between birth and 9 months, and 9 months and 3 years. By age 9 months infants whose mother was a lone parent were significantly more likely to be injured than those living in couple households, with a relative difference (RD) of 1.23 (1.06, 1.42) and an absolute difference (AD) of 1.78% (95% CI: 0.42, 3.14). There were no differences according to NS-SEC or area deprivation. There was no difference by maternal education, with the exception of infants whose mothers had no qualifications who were 72% (0.59, 0.87) as likely to be injured compared to those whose mothers had a degree, with a absolute difference of -2.41% (-3.84, -0.98). Evidence suggests that more educated mothers are more likely to report minor injuries than less educated mothers[23]; this might explain the lower risk observed in infants of less educated mothers. For injuries occurring between 9 months and 3 years, inequalities had emerged according to NS-SEC, maternal education and area deprivation, as well as lone parenthood. The AD between the highest and lowest group for all three measures was in region of 4% to 7%, with a RD ranging from 1.14 to 1.22.

*Table 3.2: Injury between birth and 9 months, and 9 months and 3 years in the MCS, according to SECs: weighted % (N), relative and absolute differences (95% CIs) with the most advantaged SECs group as baseline*

| | **Birth - 9 months** | | | **9 months - 3years** | | |
|---|---|---|---|---|---|---|
| | *% (N) injured* | *Relative difference (95% CI)* | *Absolute difference (95% CI)* | *% (N) injured* | *Relative difference (95% CI)* | *Absolute difference (95% CI)* |
| *NS-SEC* | | | | | | |
| Routine | 8.9 (680) | 1.13 (0.98, 1.32) | 1.05 (-0.18, 2.28) | 39.2 (2271) | 1.18 (1.11, 1.26)* | 6.06 (3.74, 8.39)* |
| Intermediate | 7.7 (280) | 0.98 (0.84, 1.15) | -0.12 (-1.33, 1.09) | 34.7 (1036) | 1.05 (0.97, 1.13) | 1.63 (-0.87, 4.13) |
| Managerial | 7.9 (372) | - | - | 33.1 (1366) | - | - |
| *Education* | | | | | | |
| No qualifications | 6.2 (223) | 0.72 (0.59, 0.87)* | -2.41 (-3.84, -0.98)* | 35.6(847) | 1.14 (1.03, 1.26)* | 4.31 (1.03, 7.60)* |
| GCSE D-G | 9.9(177) | 1.17 (0.95, 1.45) | 1.27 (-0.70, 3.25) | 38.1 (577) | 1.22 (1.11, 1.34)* | 6.90 (3.60, 10.20)* |
| GCSE A-C | 8.1 (495) | 0.94 (0.79, 1.12) | -0.48 (-1.90, 0.94) | 38.0 (1863) | 1.22 (1.13, 1.32)* | 6.79 (4.16, 9.41)* |
| A Levels | 9.3 (160) | 1.09 (0.90, 1.33) | 0.71 (-1.06, 2.49) | 34.3 (481) | 1.10 (0.98, 1.23) | 3.05 (-0.70, 6.80) |
| Diploma | 7.8 (128) | 0.92 (0.73, 1.16) | -0.77 (-2.62, 1.07) | 35.4 (469) | 1.13 (1.02, 1.26)* | 4.20 (0.56, 7.85)* |
| Degree | 8.6(233) | - | - | 31.2 (764) | - | - |
| *Lone parenthood* | | | | | | |
| Lone parents | 9.6 (297) | 1.23 (1.06, 1.42)* | 1.78 (0.42, 3.14)* | 40.5 (944) | 1.17 (1.09, 1.25)* | 5.86 (3.23, 8.50)* |
| Couple families | 7.9 (1146) | - | - | 34.7 (4136) | - | - |
| *IMD (quintile)^* | | | | | | |
| Most deprived | 8.5 (291) | 1.04 (0.84, 1.29) | 0.36 (-1.41, 2.12) | 36.8 (934) | 1.22 (1.10, 1.34)* | 6.60 (3.42, 9.78)* |
| 2 | 9.4 (220) | 1.16 (0.93, 1.45) | 1.30 (-0.62, 3.22) | 38.2 (682) | 1.27 (1.14, 1.40)* | 8.03 (4.59, 11.46)* |
| 3 | 7.2 (135) | 0.88 (0.70, 1.13) | -0.94 (-2.83, 0.95) | 37.1 (591) | 1.23 (1.11, 1.37)* | 6.93 (3.44, 10.43)* |
| 4 | 7.4 (113) | 0.92 (0.71, 1.18) | -0.67 (-2.64, 1.31) | 33.2 (463) | 1.10 (0.99, 1.23) | 3.06 (-0.47, 6.59) |
| Least deprived | 8.1 (113) | - | - | 30.2 (432) | - | - |

*P<=0.05. ^ England only. Baseline for RDs and ADs are the most advantaged groups for each SECs measure

### *3.2.5 Strengths and limitations of the injury data*

The strength and limitations of the MCS and HES datasets, and the relevant variables used to explore injury throughout this thesis, are now discussed. Issues related to specific analyses are discussed in Chapters 5 and 6. The strengths and limitations of the childcare measures are considered in the following chapter (Chapter 4).

The breadth of information collected in the MCS, the large sample size, and the over-sampling of ethnic minorities and people living in disadvantaged areas has enabled the investigation of a number of policy areas and aspects of health, in a contemporary cohort of UK children, over time. Survey weights were used to take into account the sampling design, allowing estimates of prevalence and inequalities in prevalence to be extrapolated to the UK. 80% of children who were included in the first sweep took part at the second. Those who did not take part in the second sweep were more likely to be from an ethnic minority background or a more disadvantaged household, although due to the sample design these proportions remained higher than the general population. Response weights were applied to account for loss-to-follow up between sweeps, although these are unlikely to have fully compensated for attrition bias. However there was no significant difference in injury rates between birth and 9 months between children who did not respond to the second sweep and those who did, with an un-weighted absolute difference (in injury rates) of 0.48% (95% CI -0.52, 1.47%).

In the MCS, injury was based on maternal report of the child having attended a doctor, health centre, or hospital. Therefore injuries for which no professional advice was sought have not been explored. Attendance at a GP, health centre or A&E does not give an indication of the seriousness of the injury. It is possible that the propensity to seek professional advice about injuries, or to recall them, may vary by socio-economic background. Studies have shown a reasonable to high level of agreement between maternal recall of injury and medical records, with no differences by socio-economic characteristics[121-123]. However evidence suggests that parents from more advantaged backgrounds are more likely to take their child to A&E for minor injuries than those from less advantaged backgrounds.[124;125]. This may explain why infants whose mothers had no qualifications were less likely to be injured between birth and 9 months than those whose mothers had a degree, an association also observed in the Avon Longitudinal Study of Parents and Children[23] (although in the MCS, for the period 9 months to 3 years, the reverse was true).

The definition of injury in the HES data used throughout this thesis included 'undetermined injury'. A shift from recording codes for maltreatment syndrome to underdetermined cause has been documented in the UK over the past decade, possibly due to changes in coding instructions, two high profile court cases against paediatricians alleging maltreatment, and the increase in awareness through policies of the need to safeguard vulnerable children [126]. Therefore it is possible the recent rises in injury rates in infants observed in the HES data presented in this thesis are in part explained by rises in undetermined injury.

It was rarely possible to directly compare data between the national datasets and the MCS, due to differences in sample (the HSE was limited to England whereas the MCS was UK-wide), variations in the data captured (for example HES holds information on injuries requiring hospital admissions, whereas the MCS collected information on injuries requiring attendance to a doctor, health centre, or hospital), or differences in the way in which questions were asked (in the IFS mothers were asked to list all childcare they used in no order or priority so it was not possible to measure main childcare, as was done in the MCS).

It was possible to measure several measures of SECs at the maternal, household and area level. As pointed out in Chapter 2, the social class of the father or partner was not explored due to high levels of missing data. NS-SEC and maternal education which had been created for the first sweep were used for both first and second sweep analyses, although they were unlikely to have changed between sweeps. 10% of mothers had changed lone parenthood status between the first and second sweeps (6% had become lone parents whilst 5% were no longer lone parents). 19% of families who were living in England at both sweeps were living in a different quintile of area deprivation (13% had moved to less deprived areas). Measures of lone parenthood and area deprivation collected at the second sweep were therefore used for analyses using outcomes from the second sweep, although it is possible that changes in lone parenthood and area deprivation may in some cases have occurred closer to the first sweep. Inequalities in injuries according to area deprivation are not directly comparable to the other measures of inequalities, because these figures were limited to families living in England only (whilst the Index of Multiple Deprivation (IMD) is available for the other UK countries,

they are all constructed using internal ranks and so cannot be compared cross-nationally)[127].

## 3.3 Findings from the review of reviews and map of review evidence

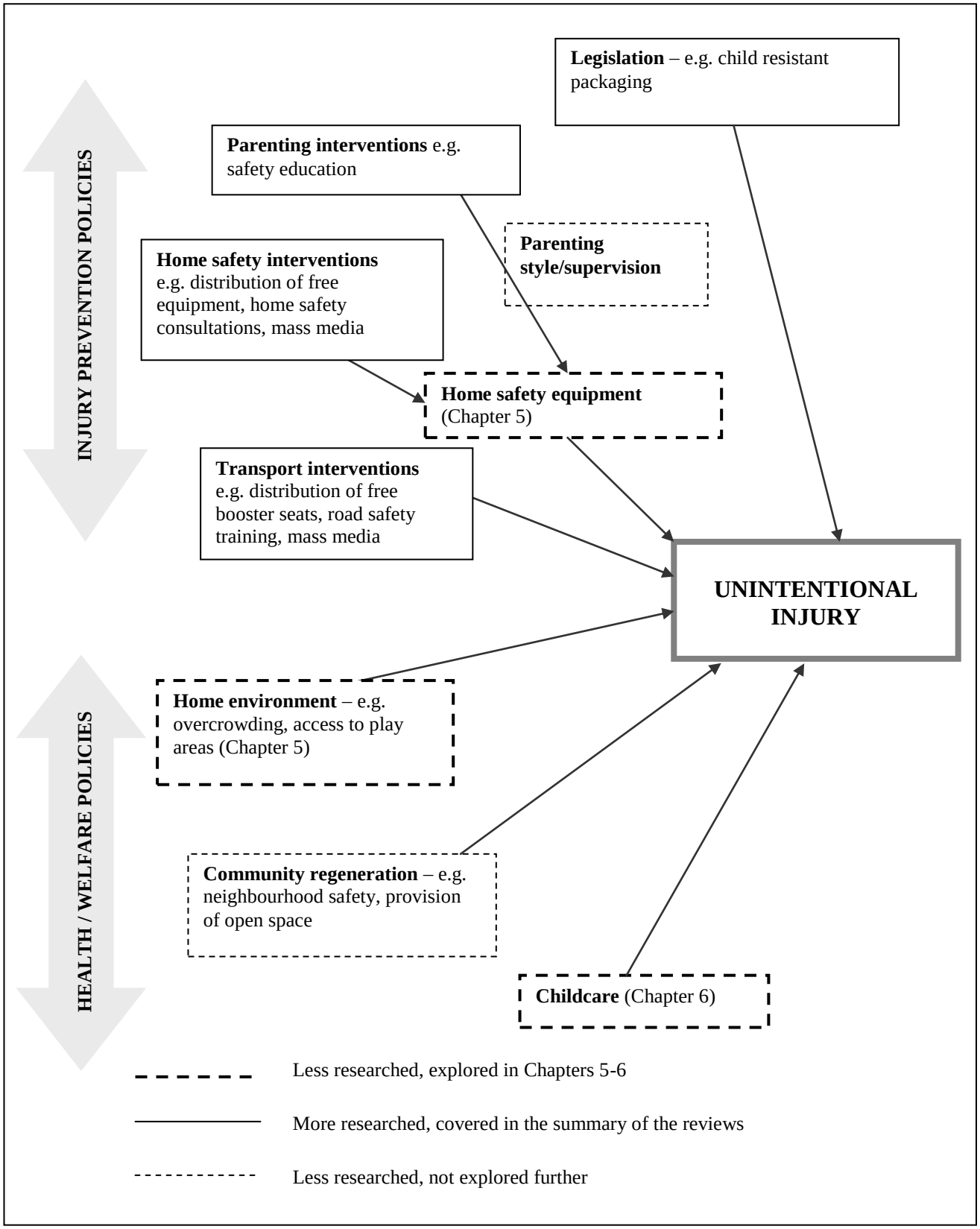
The map of review evidence in Figure 3.3 demonstrates the links between potential policy areas and unintentional injuries in children which were identified in the review of reviews. Policies which have solid lines were explored in the reviews and are summarised shortly. These tended to be specific schemes or interventions designed to reduce accidents and injuries in children (not always preschool children specifically) through modifying exposure or vulnerability to exposure. Areas which were identified as being less well researched were childcare, community regeneration (e.g. social capital, open space, fear of crime) and the home environment (e.g. overcrowding, garden access, storey of main living accommodation); these are shown in Figure 3.3 with dotted lines. The links with bold dotted lines are those that are explored using secondary data analysis in Phase 2. The map does not demonstrate differential effects. For the areas which were covered in the reviews, differential effects (or lack of) are considered in the summaries below. For the areas which were less well researched and identified for further analysis in Phase 2, differential effects are considered in depth in Chapters 5-6.

### *3.3.1 Better researched areas*

**Transport related interventions and injury**

There is a range of experimental research investigating the effect of transport-related interventions for reducing injury in childhood, although many are less relevant for younger children (such as the promotion of cycle helmet use and pedestrian skills training)[79]. A systematic review of community-based programmes to promote car seat restraints found that the programmes increased car restraint use in children aged one-five years and reduced motor vehicle occupant injury[80]. Similarly, a review aiming to collate the evidence for injury prevention in children found that the loan of car seats and educational programmes increase the number of infants who are transported safely and that legislation for the restraint of children in cars is effective in reducing injury rates[79]. Whilst some of these interventions were aimed at more disadvantaged groups, none compared the impact in different social groups or on inequalities in injury.

*Figure 3.3: Map of review evidence for the unintentional injury case study demonstrating the better and less well researched links between policies and injuries*




The map does not demonstrate differential effects; this is addressed for each link individually later on in the report.

**Home safety interventions and injury**

A systematic review of 80 randomised controlled trials (RCTs) of home safety education programmes provided to children and young people (under 19 years) and their families found them to be effective in increasing a range of safety practices in the home such as ownership of safety gates (which have been fitted) and functional smoke alarms, and the safe storage of medicines, cleaning products and sharp objects[72]. Educational interventions were particularly effective when combined with the provision of low cost or free safety equipment. The authors of the review were unable to address whether interventions were more or less effective in disadvantaged families, or whether the interventions in turn lead to a reduction in injuries, due to the small number of studies investigating or presenting these data. A systematic review of group interventions (such as interactive learning and group activities including puppet shows and games) in children aged three-six years suggested that group interventions could have the potential to enhance children's safety knowledge and behaviours, with five out of nine studies reporting a positive effect (although three reported mixed effects)[70]. A further review of the effectiveness of the provision of home safety equipment and home risk assessments also found some evidence for an increase in functional smoke alarm use, although evidence for other types of safety equipment was limited, particularly in relation to their impact on injuries rates [84].

**Parenting interventions and injury**

A systematic review of 15 studies (11 RCTs) assessed the impact of parenting interventions aimed at improving child health and wellbeing on unintentional injury in children under the age of 18 (two parenting interventions were purely educational, thirteen included other support services, and 11 also included home visiting programmes). Parenting interventions were found to reduce the number of hazards in the home and increase safety practices[73]. Nine RCTs indicated a slightly lower risk of injury. The authors concluded that there is some, but not conclusive, evidence that parenting interventions can be effective in reducing injuries in the home.

**Mass media campaigns and injury:**

Mass media campaigns can include transport-related interventions, and home safety and parenting interventions, as discussed previously. However in some cases the effect of mass media was separated out from various packages of interventions and so are

reported separately here (although not in Figure 3.3). A review of strategies to reduce childhood injuries found that, although mass media campaigns increase safety awareness and knowledge, they did not appear to reduce injury rates [79]. However another review found that campaigns targeted specifically at increasing car restraint use in children, increased restraint use and also a reduction in injury rates[80].

**Legislation and injury**

A recent review of strategic policies and regulatory or legal frameworks for the supply and/or installation of home safety equipment and home risk assessments was conducted to assess impact on injury reduction within the home. There were no studies from the UK and findings from elsewhere were mixed[83]. Window guard legislation in New York reduced injuries by half. Whilst some studies found that hot water tap temperature laws were associated with a non-significant lower risk of burns, other studies found the risk increased. Smoke detector laws increased the proportion of homes with functioning smoke alarms and swimming pool fences were associated with a lower risk of drowning. However the differences in legal systems, responsibilities and enforcement in the USA and Australia (where most of the studies were based) compared to the UK means that many of these findings are not likely to be transferable[83]. However legislation for the restraint of children in cars has been found to reduce injury and death rates from road traffic accidents[79].

**Inequalities in injury**

Very few of the interventions in the reviews assessed the impact in different social groups, and many were only aimed at high risk families (typically from less advantaged groups). A systematic review exploring the differential impact of all types of interventions on injury by social group confirmed this, stating that there is a paucity of evidence for addressing social inequalities in injury[82].

### *3.3.2 Less well researched areas*

Several areas were highlighted as requiring further research in the reviews. Discussion papers identified in the search for the reviews raised other feasible policy areas which appeared to be under-researched (that is they were not explored in the reviews).

**Childcare and injury**

A systematic review exploring risk factors associated with falls in children aged nought-six[75] explored childcare as a potential influencer of unintentional falls in childhood, and found two studies which had explored childcare centre attendance in relation to falls (both of which found an elevated risk). Since this was the only review to touch upon childcare, and because it was only in relation to one type of injury (falls), childcare is considered to be an area requiring further research in Figure 3.3.

**Neighbourhood environment/ regeneration and injury**

A discussion paper[71] used a health beliefs model and epidemiological theory to make suggestions for modifications to nursing practice to reduce injuries in preschool children. In this paper it was suggested that the neighbourhood environment (e.g. traffic, safe play areas) and social surroundings might influence injury rates. A review of multilevel studies exploring area level effects on child and adolescent health and wellbeing (including unintentional injury) [78] found only two studies that had explored unintentional injury. Only one of these explored injuries in preschool children, and both were cross-sectional. It was therefore concluded that further research was required in relation to the association between neighbourhood characteristics and injury in children.

**Home environment and injury**

A discussion of Cochrane reviews emphasised the need for further evidence on the impact of modifications to the home environment on injury prevention in children and the elderly[74]. It was also hypothesised in two discussion papers[71;81] that physical factors in the home environment, such as poor lighting, overcrowding, build type, and levels of disrepair might influence the risk of childhood injury. One of these papers[81], explored four areas of behavioural risk factors which the authors felt might influence injuries. These were demographic factors, child factors (temperament, personality and cognitive development), parental factors (supervision, parenting quality and style) and role of peers. In discussing these factors, the paper highlighted household conditions, such as homes being in a state of disrepair, limited safe playing space outdoors and high concentrations of traffic as possible explanations for the higher rates of injuries in children from disadvantaged backgrounds[81]. A further discussion paper highlighted riskier home environments as a potential explanation for higher rates of injury in children of lone parents[77].

**Parental supervision and injury**

The discussion paper highlighted above[81], which explored areas of behavioural risk factors, highlighted the need for further research into the role of fathers in injury risk when considering the role of parental supervision and parenting style. A systematic review exploring potential explanations for socio-economic inequalities in childhood injury suggested that variations in parenting style and supervision may contribute, although there appeared to be very little evidence to support this[76].

As outlined in Chapter 2, two of these less researched links were selected to be explored using secondary data analysis in Phase 2: the home environment and childcare (providing overlap with the childcare case study).

### *3.3.3 Strengths and limitations of the review of reviews*

Systematic reviews offer a valuable contribution to the jigsaw of evidence, however due to time limitations a scoping review was conducted to highlight areas requiring further research (and not to illustrate in depth findings, quantify effects, or to assess the quality of studies in detail). Although scoping reviews are designed to be less time and resource intensive than systematic reviews, it has been noted that they can take up to six months for three full-time staff to conduct[67]. The resource available within this project was far below this and therefore a scoping review of *reviews* rather than of individual level studies was conducted; a method used by civil servants known as a quick scoping review[69].

The literature databases and websites which were searched tended to have a Western bias, although research outside these settings was not considered to be relevant due to variation in social and policy contexts between UK and non-western countries. The reviews were read in depth and their content used to create a simple description of the scope of research that had been conducted in the relevant areas, and this was used to create a simple map of review evidence. Key characteristics of the reviews such as year, study design, and setting were noted. However these factors were not assessed using a descriptive-analytic method, whereby a common analytical framework is applied and standard information is summarised for each study, which is the technique recommended by the York framework[67]. Many of the reviews identified were of randomised control trials rather than observational studies, and therefore it is possible that areas highlighted as requiring further research may, in fact, have just been lacking

experimental evidence. As is typical of scoping reviews[67], the quality of the reviews or of the studies they were assessing was not used as a precursor for inclusion or exclusion from the maps. Therefore the areas identified as requiring further research do not necessarily identify areas in need of *better quality* research.

## 3.4 Summary of findings

- The first cross-government strategy for improving children and young people's safety was published in 2008. Accompanied by a Public Service Agreement (PSA) target to improve children and young people's safety, strategy commitments included a new home safety equipment scheme and continued investment to make social sector housing safer.
- Although there has been an overall decrease in childhood injury rates and death rates from injury over the past decade, data from Hospital Episode Statistics (HES) indicate that hospital admissions due to unintentional injuries in one-three year olds have remained constant, and that they may have increased for infants.
- Prior to the policy changes outlined above, 8% of infants in the MCS had attended a doctor, health centre, or hospital due to an injury between birth and 9 months, and 36% between age 9 months and 3 years. Injuries were socially patterned in infancy (although only according to lone parenthood) and between 9 months and 3 years (according to all four measures of SECs explored: NS-SEC, maternal education, lone parenthood and area deprivation).
- Policy areas which appeared to be better researched in the reviews (in terms of their impact on injury) tended to be specific schemes or interventions designed to reduce accidents and injuries in children. Areas which did not feature in the reviews, or were highlighted as requiring further research, were: childcare, community regeneration (e.g. social capital, open space, fear of crime) and the home environment (e.g. overcrowding, garden access, storey of main living accommodation).
- Two policy areas were selected for further exploration (in relation to their impact on inequalities in injuries) using data from the Millennium Cohort Study: home environment (Chapter 5) and childcare (Chapter 6).

In the next chapter, the equivalent results for the childcare case study are presented.

# 4 Chapter 4 – Childcare: policy context, trends and inequalities, and links with child health

In the previous chapter a detailed background of the injury case study was provided. In this chapter the equivalent information is presented for the childcare case study. Firstly the policy context, trends and inequalities in childcare are described. Following this the main findings from the review of reviews are summarised, and a map of review evidence is presented to highlight areas identified in the reviews as requiring further research.

## 4.1 Objectives

- To describe childcare in terms of:
- General background (4.2.1)
- The policy context (4.2.2)
- Trends in the national datasets (4.2.3)
- Prevalence and inequalities in the MCS (4.2.4)
- To conduct a review of reviews and to produce a map of review evidence exploring childcare use in relation to child health (4.3)

## 4.2 Description of childcare case study

### *4.2.1 Childcare: general background*

Increases in lone parent families[128] and paid employment rates in working-age women and mothers [129] have led to an increased demand for childcare. An analysis of family-related policies in OECD countries found that, based on 2003 figures, public spending on formal childcare was below the OECD average in the UK and less than half of that spent in France and the Nordic countries[130]. In addition to this, childcare fees were considerably higher than the OECD average (requiring 25% of the average working wage, compared to 16% across all OECD countries, and a low of 4% in Hungary). As such, the net costs of childcare for dual earning families (with full-time earnings of 167% the national average) were high after accounting for income tested childcare support, with the UK coming in second to highest, after Ireland. At the time of data collection (2004) the UK fared better for lone parents (earning 67% of the national average wage), due to the range of benefits available to support this group (although costs were still above the OECD average)[130].

The Childcare and Early Years Survey of Parents 2008 found that parents from disadvantaged families are less likely to be satisfied with the quality of childcare and, despite the 2004 childcare strategy's aim to improve the affordability, availability and quality of childcare, these factors continue to act as a barrier to paid employment for mothers, especially those from disadvantaged backgrounds[131]. The annual Ofsted report of childcare providers and registered childminders found that the quality of childcare (as assessed in routine inspections in 2008/09) was slightly lower in the 20% most deprived areas compared to the rest of England (the least deprived 80%)[132]. In deprived areas the quality of childminders was lower than childcare centres, however in other areas the quality of childminders compared to childcare centres was similar. This highlights the potential importance of exploring different types of childcare in different socio-economic groups.

A sub-study of the MCS explored the quality of formal childcare settings attended by MCS children when they were aged 3 years (in 2004). In the main survey mothers were asked to provide the details of their current or recent childcare provider and if they were happy for the provider to be to contacted. 301 childcare centres (caring for 632 MCS children) were included in the study, and their quality was investigated using three observational instruments to assess factors such as personal care routines and caregiver interactions[133]. In contrast to findings from the Ofsted assessment of childcare providers and childminders[132], the MCS study found that the quality of childcare was higher in more deprived families and that Local Education Authority (LEA) maintained childcare settings were of better quality than private childcare providers. These conflicting findings may be due to the studies being conducted at different time points (the MCS sub-study was carried out in 2005, whereas the Ofsted study referred to data collected in 2008/9). In addition to this, different measures of disadvantage were used (Ofsted looked at quality according to area deprivation, whereas the MCS sub-study explored individual level SECs). The authors of the MCS sub-study pointed out that it is possible that, in deprived areas, children from less advantaged families have better access to the higher quality childcare than those from more advantaged families[133]. It may also be due to random error or response bias in the MCS sub-study.

### *4.2.2 Childcare policy context*

The policy context for childcare in the UK, which was derived using descriptive rather than critical analysis techniques, is now summarised. In 1998 the Labour government

launched the National Childcare Strategy and Sure Start, as part of their policy to promote paid employment as a route out of poverty, and in response to a shortage of childcare places, high costs and scarce information for parents[134]. Over the following three years, the number of childcare places increased and the childcare workforce grew by one fifth; it was at about this time that the MCS children were born (see Figure 4.1). The Neighbourhood Nurseries Initiative targeted provision in disadvantaged neighbourhoods where it was more likely to be lacking, and the Working Families Tax Credit with a childcare element was introduced, which raised the amount that families could claim towards childcare costs (for providers registered on the Early Year register) to 70% of £100 for families with one child and 70% of £150 for those with two or more[135]. Furthermore it was promised that all children aged three-four years would be guaranteed an early year's education place by 2004, for 12.5 hours a week for 33 weeks a year, and national standards were devised to outline minimum quality levels for childcare for children under the age of eight[134].

In 2002 an inter-departmental review of childcare was carried out[136]. In order to meet the Government's targets to reduce child poverty and increase paid employment in lone parents, it was concluded that new investment in childcare was required. Integral to this review were early findings from the Effective Provision of Pre-School Education (EPPE) Project which found that preschool attendance enhances children's development, particularly for those from disadvantaged backgrounds[137]. Full-time attendance did not carry better gains for children than part-time attendance and children tended to do better in fully integrated centres and nursery schools. Informed by the inter-departmental review and these findings from the EPPE project, a new ten-year childcare strategy was launched in 2004[17]. In 2006 the Childcare Act was passed to take forward the commitments laid out in the strategy.

Integral to the strategy were Sure Start Children's Centres, bringing together previous Sure Start services such as Sure Start Local Programmes, Neighbourhood Nurseries and Early Excellence Centres. Children's Centres provide integrated early childhood services for those with children under five years of age, including information and advice, drop in sessions and activities for parents, outreach and family support services including home visitors, health services, training and employment advice, and support for childminders[138]. An early years qualification (Early Years Professional Status (EYPS)) was launched, with the view to every early years setting having at least one

professional staff member by 2015[139]. In addition to this, Children's Centres in the 30% most deprived communities were required to provide early education and childcare places for a minimum of five days a week, ten hours a day[138].

The 2004 childcare strategy aimed to increase the availability, flexibility, quality and affordability of childcare in order to improve outcomes for children, reduce the gap between the rich and poor, and to support parents into work. By this time the aim to provide free early years education places to all children aged three-four years, as part of the previous 1998 childcare strategy, had been achieved. According to Ofsted data uptake of free early education places was almost universal in England when the MCS children were age 3[140], and quality was good and improving[141]. Under the new childcare strategy it was pledged that the free entitlement would increase from 33 to 38 weeks a year by April 2006 and that the hours would be extended from 12.5 to 15 hours a week by September 2010[17]. Free places were made available to two-year olds living in the 25% most deprived areas in England[142] in September 2009. In 2005 the maximum eligible childcare costs that help could be claimed for through the childcare element of the Working Tax Credits increased from £135 to £175 a week for families with one child, and from £200 to £300 for those with two children or more (where a maximum of 70% of these costs could be claimed, depending on household income)[17]. In addition to this, a childcare voucher scheme was introduced in 2005 and enabled parents to buy childcare vouchers or provision from their employers before tax and national insurance deductions. In 2006 the maximum *proportion* of childcare costs for which families could claim increased from 70% to 80%[17].

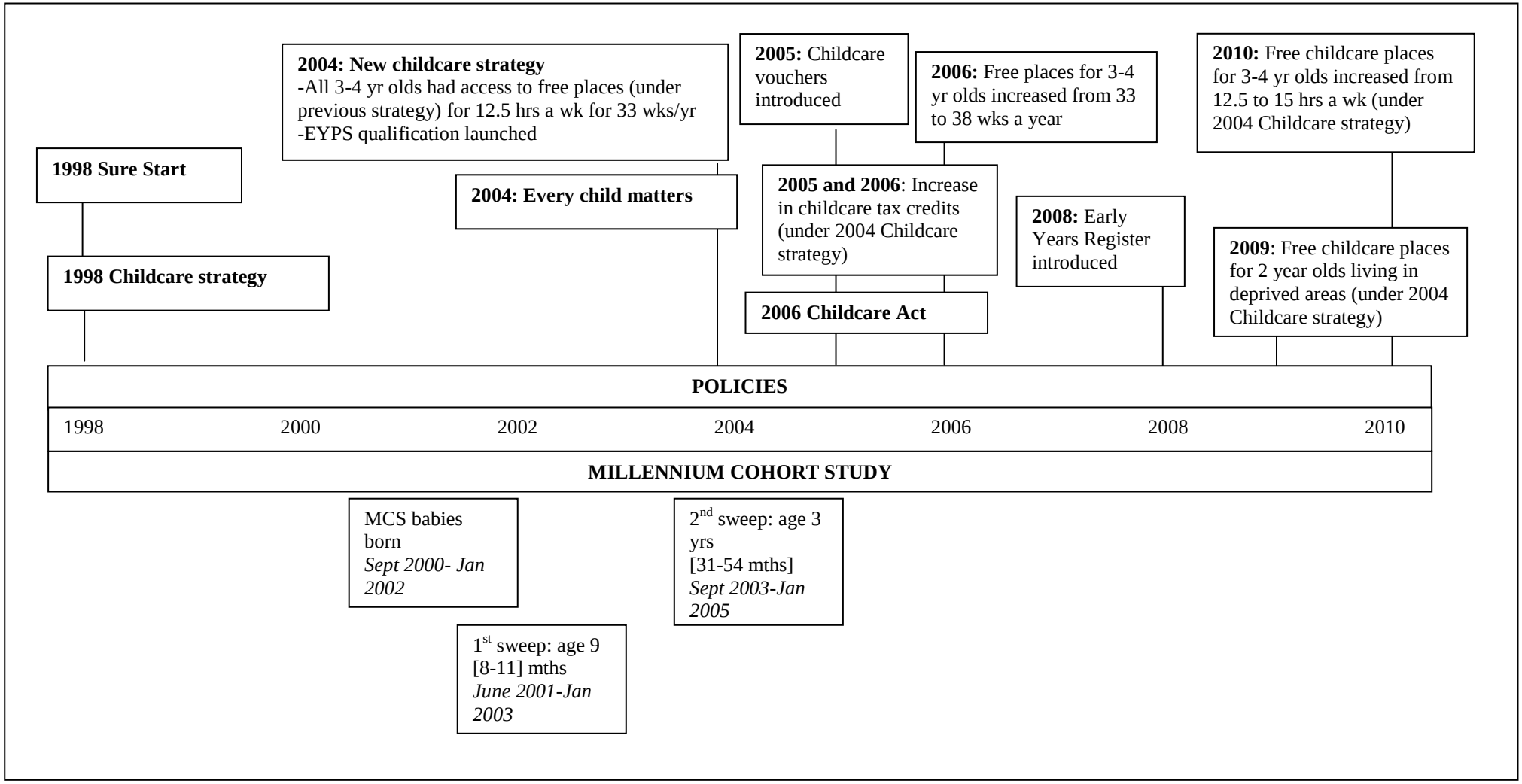
As of September 2008 childcare providers and childminders have been required to be recorded on the Early Years Register if they care for at least one child under the age of five years, and on the Childcare Register if they provide care to at least one older child from the age of five-eight years[143]. Childcare providers are classified as those providing care on non-domestic premises, or who care with at least three other people on domestic premises. Childminders are classified as those who provide care on domestic premises to unrelated children under the age of eight, from more than two families, for at least two hours in any day, and for which 'reward' is received[143]. Inspections are carried out at random by Ofsted and include an assessment of safety, adherence to the Early Years Foundation Stage (where registered on the Early Years register), staff policies, and parent's views. Carers who are not related to the child, who receive remuneration, but

look after children from only one or two families (e.g. nannies) are entitled to register on the voluntary part of the register (and must do so if parents want to receive tax credits for that care). Relatives and other informal carers who provide childcare without remuneration are exempt from registration and are overlooked in the majority of childcare policies in the UK. However the role of grandparents as carers is becoming increasingly acknowledged and in 2009 it was proposed by the Labour government that those who care for grandchildren under the age of 13 years for at least 20 hours a week be provided with National Insurance credits from April 2011[144].

### *4.2.3 Trends in childcare*

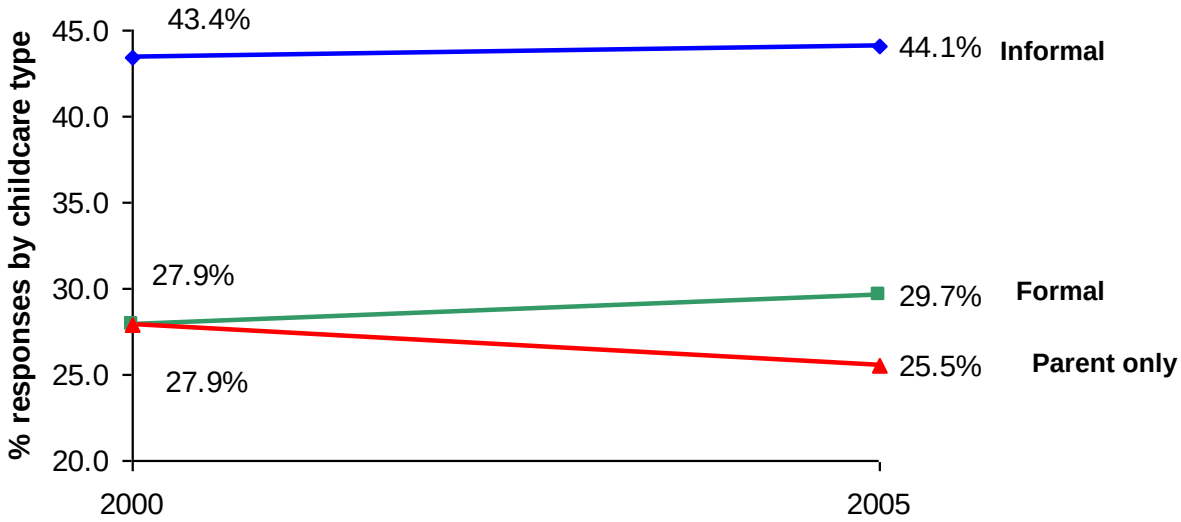
A recent United Nations Children's Fund (UNICEF) report highlighted that 80% of three-six year olds and 25% of under threes living in OECD (Organisation for Economic Co-operation and Development) countries are now cared for in early childhood education or childcare settings[145]. Care by grandparents has also increased in recent years, parallel to the rise in maternal paid employment and lone parenthood, and also extended life expectancy [146;147]. In 2004 some of the older MCS children would have reached age three years and therefore would have been entitled to the free early years education places offered to three-four year olds for 12.5 hours a week (Figure 4.1). By this time uptake of free nursery places was almost universal in England according to Ofsted data[140], although information from a survey of parents in 2008 indicates that uptake is lower in more disadvantaged families[131]. Childminders were the largest non-parental childcare provider up until the late 1990s in England. However the use of childminders has since started to decline[148;149], potentially due to the increase in nursery providers and the introduction of free early year's education places and subsidies through tax and benefits systems[148].

*Figure 4.1: Timeline to demonstrate when childcare policies were introduced, in relation to the Millennium Cohort sweeps*



The Infant Feeding Survey (IFS) provides information on childcare use in mothers who were in paid employment in 2000 and 2005, when their children were age nine months old. Mothers were permitted to give multiple responses, in no particular order, and so Figure 4.2 shows the distribution of all reported childcare, categorised as informal (neighbours, friends, grandparents, other relatives) or formal (all childminders, nurseries, childcare centres, nannies). Informal childcare use remained relatively stable at 43.4% and 44.1% in 2000 and 2005 whilst formal childcare use increased from 27.9% to 29.7%. The proportion of employed mothers using no childcare ('parent only') declined from 27.9% to 25.5%.

*Figure 4.2: Trends in childcare use in infancy, 2000-05, Infant Feeding Survey*




A report published in 2004 comparing data on childcare use and maternal employment from the Family Resources Survey, the Families and Children Study, the Labour Force Survey and Parent's Demand for Childcare, found comparability to be limited for a number of reasons including the ways in which the questions were worded, variations in coverage (for example some surveys only asked for childcare information from employed mothers), and differences in timing[149]. The report focussed mainly on childcare in all children aged 14 and under, and estimates of childcare use in certain age groups (for example in infants or preschool children) carried a large amount of error. The authors if the report concluded that there is mixed evidence regarding trends in childcare use overall, but that there is conclusive evidence of an increase in formal childcare[149].

### *4.2.4 Prevalence and inequalities in childcare, in the MCS*

In the MCS 34.6% of infants were regularly cared for (for any amount of time) in informal childcare (and over three quarters by grandparents), 15.7% were cared for in formal childcare, and 49.7% were only cared for by a parent. Between the age of 9 months and 3 years 31.1% of children were cared for in informal childcare (again over three quarters by grandparents), 28.3% were cared for in formal childcare, and 40.6% were cared for only by a parent (Table 4.1). These proportions are not directly comparable to the IFS due to the way in which the questions around childcare were asked.

*Table 4.1: Childcare use between birth and 9 months, and 9 months and 3 years, in the MCS: weighted % (N)*

| **Childcare** | **Birth-9mths % (N)** | **9mths – 3yrs % (N)** |
|---|---|---|
| Parent only | 49.7 (9096) | 40.6 (5681) |
| Informal | 34.6 (6649) | 31.1 (4449) |
| *Grandparent* | *27.6 (5246)* | *24.2(3477)* |
| *Other* | *7.0 (1403)* | *6.9 (1002)* |
| Formal | 15.7 (2391) | 28.3 (3621) |
| Total N | 18136 | 13751 |

Table 4.2 presents informal and formal childcare use in the MCS between birth and age 9 months by SECs. Children from lower SECs were significantly more likely to be cared for only by a parent than those from more advantaged groups. For example children whose mothers were from routine and manual groups were 77% more likely to be cared for only by a parent than children whose mothers were from managerial and professional groups (95% CI: 1.68, 1.87), with an absolute difference (AD) of 25.91% (23.86, 27.96). There was no clear pattern for informal childcare use; infants living with a lone parent were less likely to be looked after in informal childcare (RD=0.91 [0.85, 0.97]; absolute difference (AD) =-3.21% [-5.39, -1.03]) than those living with a couple family, whereas those living in more deprived areas were more likely to be looked after in informal childcare than those living in the least deprived areas. Children from lower socio-economic backgrounds were significantly less likely to be cared for in formal childcare for all measures of SECs: for example infants whose mothers were from routine and manual backgrounds were less likely to be looked after in formal childcare compared to infants whose mothers were from managerial and professional groups (RD=0.11 [0.13, 0.98]; AD=-31.29% [-33.39, -29.18]).

Between the age of 9 months and 3 years (Table 4.3) children from lower SECs were more likely to be cared for only by a parent, and relative and absolute differences were statistically significant for all SECs measures except for lone parenthood. As seen between birth and 9 months, there were no clear patterns of informal childcare use; children whose mothers had no educational qualifications were less likely to use informal childcare (RD= 0.84 [0.73, 0.97]) than mothers who had a degree with an absolute difference of 4% (-7.20,-0.85), although groups who were educated to the GCSE level and above were more likely to use informal childcare than those with a degree. Those living in the second most deprived areas in England were more likely to use informal childcare (RD=1.42 [1.26, 1.59]; AD=10.52% [7.14, 13.91]) than those living in the least deprived areas. Those from less advantaged groups were consistently less likely to use formal childcare, for example mothers from routine and manual backgrounds were a third as likely to use formal childcare (RD=0.36 [0.33, 0.39]) than those from managerial and professional backgrounds, with an absolute difference of -30.00% (-32.36,-27.64).

*Table 4.2: Childcare between birth and 9 months use in the MCS, according to SECs: weighted % (N), and relative and absolute differences (95% CIs) with the most advantaged SECs group as baseline*

| | **Parent only** | | | **Informal** | | | **Formal** | | | **Total %** |
|---|---|---|---|---|---|---|---|---|---|---|
| | % (n) | *Relative difference* | *Absolute difference* | % (n) | *Relative difference* | *Absolute difference* | % (n) | *Relative difference* | *Absolute difference* | |
| *NS-SEC* | | | | | | | | | | |
| Routine | 59.6 (4487) | 1.77 (1.68, 1.87)* | 25.91 (23.86, 27.96)* | 36.4 (2847) | 1.17 (1.09, 1.26)* | 5.38 (3.06, 7.69)* | 4.0 (283) | 0.11 (0.13, 0.98)* | -31.29 (-33.39, -29.18)* | 100 |
| Intermediate | 45.3 (1577) | 1.35 (1.26, 1.44)* | 11.67 (9.09, 14.23)* | 39.8 (1553) | 1.28 (1.19, 1.38)* | 8.75 (6.13, 11.36)* | 14.9 (515) | 0.42 (0.38, 0.47)* | -20.42 (-22.77, -18.06)* | 100 |
| Managerial | 33.7 (1508) | - | - | 31.0 (1661) | - | - | 35.3 (1539) | - | - | 100 |
| *Education* | | | | | | | | | | |
| No qualifications | 69.1 (2428) | 2.05 (1.89, 2.23)* | 35.43 (32.03, 38.84)* | 29.5 (1055) | 1.15 (1.02, 1.31)* | 3.94 (0.64, 7.24)* | 1.5 (47) | 0.04 (0.03, 0.05) * | -39.38 (-42.11, -36.64)* | 100 |
| GCSE D-G | 55.5 (1093) | 1.66 (1.53, 1.81) * | 22.29 (18.76, 25.82)* | 38.1 (739) | 1.49 (1.32, 1.68)* | 12.55 (8.98, 16.12)* | 6.0 (112) | 0.15 (0.12, 0.18) * | -34.84 (-37.73, -31.95)* | 100 |
| GCSE A-C | 50.4 (2983) | 1.50 (1.39, 1.62) * | 16.75 (13.86, 19.65)* | 39.7 (2528) | 1.55 (1.40, 1.72)* | 14.16 (11.29, 17.04)* | 9.9 (543) | 0.24 (0.22, 0.27) * | -30.92 (-33.70, -28.14)* | 100 |
| A Levels | 43.2 (711) | 1.29 (1.18, 1.40) * | 9.62 (6.52, 12.72)* | 36.1 (673) | 1.41 (1.28, 1.57)* | 10.58 (7.52, 13.63)* | 20.7 (295) | 0.51 (0.45, 0.57) * | -20.19 (-23.51, -16.88)* | 100 |
| Diploma | 40.0 (578) | 1.19 (1.09, 1.30) * | 6.38 (3.04, 9.71)* | 38.3 (627) | 1.50 (1.35, 1.67)* | 12.78 (9.64, 15.92)* | 21.7 (302) | 0.53 (0.47, 0.60) * | -19.16 (-22.56, -15.76)* | 100 |
| Degree | 33.6 (913) | - | - | 25.5 (857) | - | - | 40.9 (1059) | - | - | 100 |
| *Lone parenthood* | | | | | | | | | | |
| Lone parents | 60.0 (1900) | 1.25 (1.20, 1.31)* | 12.08 (9.75, 14.41)* | 31.9 (1025) | 0.91 (0.85, 0.97)* | -3.21 (-5.39, -1.03)* | 8.1 (1025) | 0.48 (0.40, 0.57)* | -8.87 (-10.78, -6.97)* | 100 |
| Couple families | 47.9 (7196) | - | - | 35.1 (5624) | - | - | 17.0 (5624) | - | - | 100 |
| *IMD (quintiles)*^ | | | | | | | | | | |
| Most deprived | 61.2 (2473) | 1.33 (1.25, 1.42)* | 15.15 (12.01, 18.29)* | 33.5 (1338) | 1.25 (1.15, 1.41)* | 6.73 (3.85, 9.60)* | 5.2 (1338) | 0.19 (0.16, 0.23)* | -21.88 (-24.35, -19.40)* | 100 |
| 2 | 51.9 (1285) | 1.13 (1.05, 1.21)* | 5.81 (2.40, 9.22)* | 38.1 (931) | 1.42 (1.31, 1.60)* | 11.31 (8.15, 14.46)* | 10.0 (931) | 0.37 (0.32, 0.43)* | -17.11 (-19.78, -14.44)* | 100 |
| 3 | 47.9 (930) | 1.04 (0.96, 1.12) | 1.82 (-1.74, 5.38) | 35.9 (696) | 1.34 (1.21, 1.49)* | 9.09 (5.82, 12.37)* | 16.2 (696) | 0.60 (0.52, 0.69)* | -10.91 (-13.85, -7.98)* | 100 |
| 4 | 44.1 (654) | 0.96 (0.88, 1.04) | -2.01 (-5.69, 1.68) | 31.8 (487) | 1.19 (1.06, 1.33)* | 5.03 (1.66, 8.40)* | 24.1 (487) | 0.89 (0.78, 1.01) | -3.02 (-6.24, 0.19) | 100 |
| Least deprived | 46.1 (636) | - | - | 26.8 (367) | - | - | 27.1 (367) | - | | 100 |

*P<=0.05. ^ England only. Missing: childcare 185, NS-SEC 245, maternal education- 66, area deprivation- 2

*Table 4.3: Childcare use between 9 months and 3 years in the MCS, according to SECs: weighted % (N), and absolute and relative differences with the most advantaged SECs group as baseline*

| | **Parent only** | | | **Informal** | | | **Formal** | | | **Total %** |
|---|---|---|---|---|---|---|---|---|---|---|
| | % (N) | *Relative difference* | *Absolute difference* | % (N) | *Relative difference* | *Absolute difference* | % (N) | *Relative difference* | *Absolute difference* | |
| *NS-SEC* | | | | | | | | | | |
| Routine | 51.7 (2907) | 2.23 (2.06, 2.41)* | 28.46 (26.05,30.87)* | 31.6 | 1.05 (0.97, 1.14) | 1.54 (-1.02,4.11) | 16.7 (887) | 0.36 (0.33, 0.39)* | -18.12 (-20.99,-15.25)* | 100 |
| Intermediate | 33.9 (947) | 1.46 (1.33, 1.60)* | 10.71 (8.04,13.37)* | 37.5 | 1.25 (1.14, 1.36)* | 7.41 (4.51,10.31)* | 28.6 (781) | 0.61 (0.56, 0.67)* | -30.00 (-32.36,-27.64)* | 100 |
| Managerial | 23.2 (866) | | | 30.1 | - | | 46.7 (1712) | - | | 100 |
| *Education* | | | | | | | | | | |
| No qualifications | 64.8 (1557) | 2.94 (2.64, 3.28)* | 42.75 (38.81,46.69)* | 21.4 (507) | 0.84 (0.73, 0.97)* | -4.03 (-7.20,-0.85)* | 13.8 (318) | 0.26 (0.22, 0.31) * | -38.72 (-41.93,-35.52)* | 100 |
| GCSE D-G | 48.9 (742) | 2.22 (1.98, 2.48)* | 26.86 (23.03,30.69)* | 33.3 (457) | 1.31 (1.16, 1.48)* | 7.84 (4.16,11.53)* | 17.8 (244) | 0.34 (0.30, 0.39) * | -34.70 (-38.00,-31.41)* | 100 |
| GCSE A-C | 40.9 (1890) | 1.85 (1.68, 2.05)* | 18.82 (16.08,21.57)* | 36.0 | 1.41 (1.29, 1.55)* | 10.55 (7.88,13.21)* | 23.2 | 0.44 (0.40, 0.48) * | -29.37 (-32.13,-26.61)* | 100 |
| A Levels | 32.0 (422) | 1.45 (1.29, 1.63)* | 9.93 (6.62,13.24)* | 33.1 (497) | 1.30 (1.16, 1.46)* | 7.68 (4.18,11.17)* | 34.9 (427) | 0.66 (0.60, 0.73)* | -17.60 (-21.24,-13.97)* | 100 |
| Diploma | 28.0 (341) | 1.27 (1.12, 1.44)* | 5.98 (2.77, 9.19)* | 36.6 (508) | 1.44 (1.29, 1.61)* | 11.16 (7.70,14.62)* | 35.4 (417) | 0.67 (0.61, 0.74)* | -17.14 (-20.82,-13.47)* | 100 |
| Degree | 22.0 (508) | - | | 25.4 (665) | - | | 52.5 (1125) | - | | 100 |
| *Lone parenthood* | | | | | | | | | | |
| Lone parents | 43.2 (962) | 1.08 (1.01, 1.15)* | 3.10 (0.40, 5.79)* | 30.5 (687) | 0.98 (0.89, 1.07) | -0.74 (-3.44, 1.95) | 26.4 (562) | 0.92 (0.84, 1.00)* | -2.35 (-4.64, -0.06)* | 100 |
| Couple families | 40.1 (4719) | | | 31.2 | - | | 28.7 (3059) | - | | 100 |
| *IMD (quintiles)^* | | | | | | | | | | |
| Most deprived | 58.7 (1543) | 1.82 (1.61, 2.06)* | 26.41 (23.10, 29.73)* | 24.2 (595) | 0.96 (0.85, 1.09) | -0.93 (-3.93, 2.07) | 17.3 (472) | 0.40 (0.36, 0.45)* | -25.48 (-28.61, -22.36)* | 100 |
| 2 | 40.5 (716) | 1.26 (1.11, 1.43)* | 8.39 (4.82, 11.96)* | 35.6 (629) | 1.42 (1.26, 1.59)* | 10.52 (7.14, 13.91)* | 23.9 (447) | 0.56 (0.50, 0.62)* | -18.91 (-22.35, -15.48)* | 100 |
| 3 | 39.8 (609) | 1.24 (1.09, 1.40)* | 7.62 (3.97, 11.28)* | 33.1 (525) | 1.32 (1.17, 1.49)* | 8.00 (4.58, 11.43)* | 27.1 (427) | 0.63 (0.57, 0.71)* | -15.63 (-19.19, -12.06)* | 100 |
| 4 | 32.7 (419) | 1.02 (0.90, 1.15) | 0.51 (-3.16, 4.18) | 30.6 (403) | 1.22 (1.07, 1.38)* | 5.46 (1.97, 8.95)* | 36.8 (483) | 0.86 (0.78, 0.95)* | -5.97 (-9.77, -2.18)* | 100 |
| Least deprived | 32.2 (435) | | | 25.1 (342) | - | - | 42.8 (594) | - | - | 100 |

*P<=0.05. ^England only.

### *4.2.5 Strengths and limitations of the childcare data*

The strengths and limitations of the childcare measures used in the MCS and IFS are now discussed. The strengths and limitations of the MCS in general, and also the SECs measures, were considered in Chapter 3.

A book published in 2010, summarising findings from the first three sweeps of the MCS[150], highlighted that the childcare data collected at the second sweep might under-report formal childcare, because the wording of the questions were too closely aligned with childcare arrangements to support mothers' paid employment rather than for the purposes of early years education. Therefore an additional retrospective question surrounding nursery school attendance was asked at the third sweep (when the children were five) in order to 'repair' the under-reporting. This additional information has been considered in Appendix 4. The decision was made to not alter the original childcare variable created for the purpose of this thesis, for a number of reasons. Firstly, as much as 51 months will have passed between age 9 months (which was the beginning of the period that the question referred to) and the third sweep which took place at 5 years. The information collected using this question therefore may be subject to recall error, particularly since the date of the second sweep interview would not have been a monumental event in the MCS families lives (as opposed to if the interview had been on the child's 3rd birthday, for example). For example, 50% of mothers who reported that their child had attended nursery school in this additional question reported that attendance had commenced six months or less before the date of the second sweep interview. Finally 11% of children who had childcare data at the second sweep did not take part in the third sweep and so would not have this additional information. However due to this potential flaw in the childcare variable, it is possible that the level of formal childcare presented throughout this thesis is underestimated for the period 9 months to 3 years.

The childcare classification used in the main analyses reported throughout this thesis explored the main type of non-parental care used (Appendix 2.4), and approximately one third of parents who used childcare used more than one type (between birth and 9 months and 9 months and 3 years). A survey of parents views on childcare provision in 2004 and 2007 found that 15% of parents used a combination of informal and formal childcare[151]. For children aged three-four years, the proportion of parents using a combination of formal and informal childcare had almost doubled to 29%, possibly due

to the need for childcare which "wraps around" the free early years education entitlement[151]. However a number of sensitivity analyses were conducted using MCS data in Chapters 6-8, repeating the main analyses in children who were only looked after in one type of childcare and the results appeared to change little. Despite this, the childcare variable can only be considered a proxy for true childcare use.

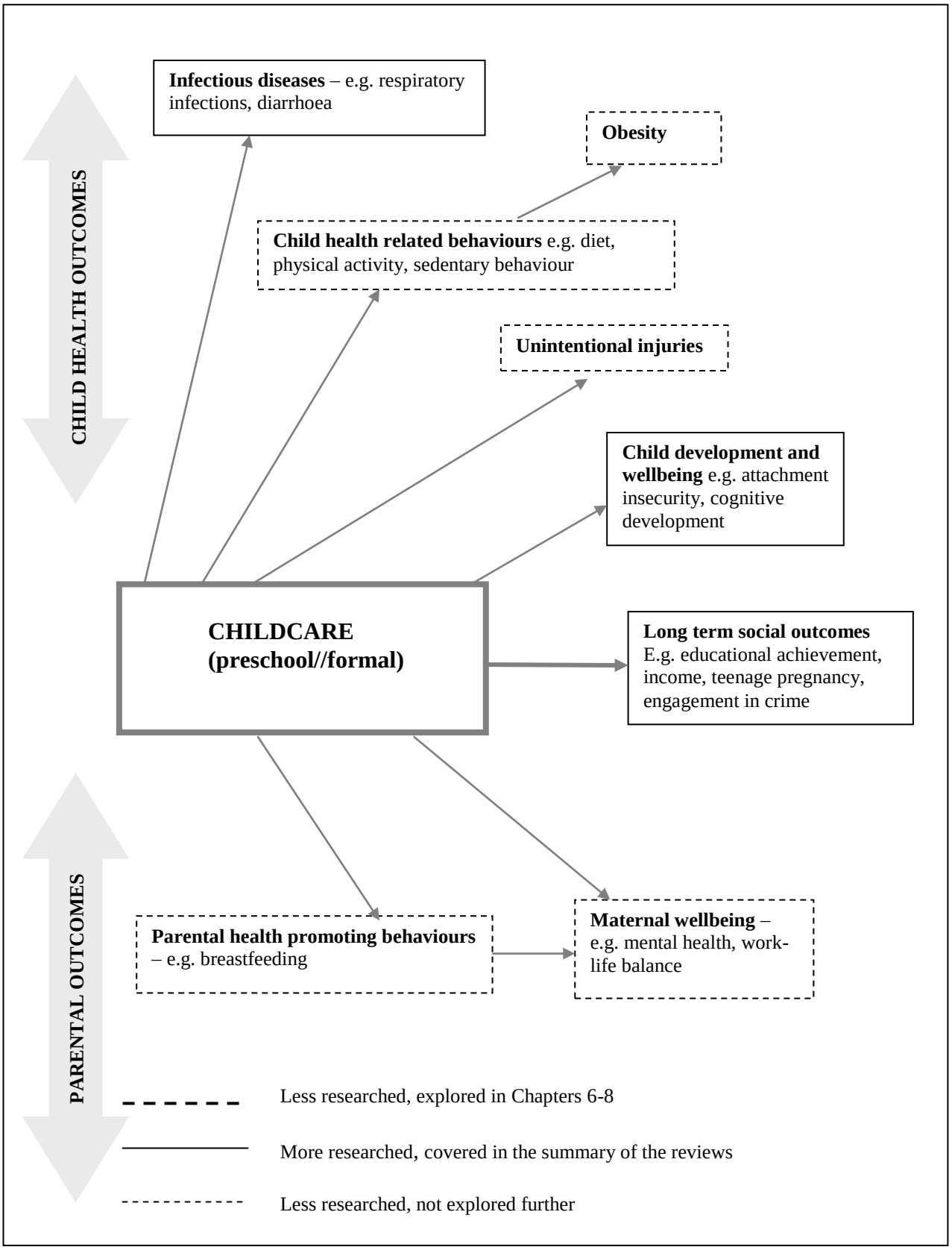
It was not always possible to explore age when the childcare commenced in this project, and so age differentials have not been investigated for many of the analyses. The MCS measure of childcare classified nannies and au pairs as formal childcare. This same classification has been used in other studies exploring childcare[131], although nannies and au pairs might also be considered informal carers because they are usually unregulated. Infants who did not take part in the second sweep were more likely to be cared for only by a parent (6.5% (4.7, 8.3)) and less likely to be cared for in formal childcare (-5.3% (-6.4, -4.3)), than those who did take part in the second sweep. Whilst response weights were used in all analyses, it is unlikely they were unable to entirely account for attrition bias.

## 4.3 Findings from the review of reviews and map of review evidence

The map of review evidence in Figure 4.3 demonstrates the links between childcare and different aspects of child health which were identified in the reviews[17;85-89]. The areas with solid lines in the map identify links that had been explored in the reviews and these are summarised shortly. Research investigating the impact of childcare on children's health has tended to focus on educational and developmental outcomes and infectious disease. Areas which were identified as being less well researched were children's health behaviours such as physical activity and diet, unintentional injury, and parental factors including health behaviours and maternal wellbeing. These are shown with dotted lines in Figure 4.3. Those with bold dotted lines are the links that are explored using secondary data analysis in Phase 2 (Chapters 6 to 8).

Some of the studies in these reviews were specifically referring to early years' education or preschool. For brevity, the broader term formal childcare (or childcare centres) is referred to, which typically involves some early years' education.

*Figure 4.3: Map of review evidence for childcare case study demonstrating the better and less well researched links between childcare and health*




The map does not demonstrate differential effects; this is addressed for each link individually later on in the report.

### *4.3.1 Better researched areas*

**Childcare and infectious disease**

Children who are cared for in childcare centres have been found to be at higher risk of acquiring infectious diseases such as respiratory infections, otitis media, diarrhoea and varicella, when compared to children cared for at home[86;88]. This risk often increases with time spent in childcare and the size of the childcare centre[86], and has also been found to vary according to hygiene practices and policies[88]. However there is some evidence that childcare affords immunity to colds as children reach primary school[86].

**Childcare and child development and wellbeing**

The majority of research exploring childcare use in relation to child development has been motivated by concerns about socio-economic inequalities in young children's language and cognitive development[85]. Research from the 1980s and 1990s indicated that children who begin full-time childcare early in life are at risk of attachment insecurity, however many studies did not account for childcare quality or other potential mediators or confounders. More recently, and allowing for these factors, studies have found that children exposed to long periods of childcare were only at risk if their mother was "highly insensitive". Findings regarding mother-child interactions are mixed[86]. More hours in childcare are associated with increased behavioural problems, although there is some evidence to indicate that these effects fade out over time. On the other hand, childcare attendance is associated with increased social competence and higher cognitive scores and IQs[17;86;89;92].

A review exploring cortisol levels in childcare (conceptualised as a proxy for stress and therefore mental health) found that cortisol levels increased during the day for children in childcare, but reduced for those who were cared for only at home[87]. The magnitude of the association varied by quality of childcare, age of child (the effect size was larger for preschoolers than it was for infants or school-aged children) and child temperament (those with "difficult temperaments" experienced bigger increases).

A review conducted to inform the 2004 childcare strategy in 2002 largely focused on findings from the UK using the EPPE study, but also made comparisons with findings from the US and Scandinavia[17]. Although the childcare strategy aimed to eliminate the

distinction between early education and childcare, the evidence was presented separately. It concluded that the evidence surrounding childcare (as opposed to early education) is mixed and dependent on a variety of factors. Group care can have negative effects on behaviour, however this is dependent upon quality. Good quality childcare can have positive influences on cognitive and language development, although the findings are less consistent than for early years education[17].

**Childcare and long term outcomes**

Some of the immediate beneficial effects of formal childcare, such as improved cognitive abilities, fade out over time. However there is evidence to suggest that there are some long-term benefits, for example increased paid employment, higher socioeconomic status, and lower rates of teenage pregnancy and criminal behaviour. It has also been postulated that these improvements may be passed on to the next generation[85;89].

**Childcare and inequalities**

Existing research has given little consideration to the impact of formal childcare on health inequalities. The majority of interventions have focussed on the impact of childcare in disadvantaged groups and so differential impacts could not be assessed[85;89]. One of the reviews explored the potential impact of preschool on child development and social mobility, focussing on studies in the US[85]. It found that uptake of preschool programmes was socially distributed, with children from lower income families less likely to participate. Since preschool attendance was associated with improved learning and developmental outcomes, and social mobility from improvements to educational achievement for example, they postulated that increasing rates of childcare use could help to reduce inequalities. On the other hand one of the reviews postulated that, because childcare quality has been found to be important for some aspects of health and wellbeing, it could widen the gap as children from higher income groups benefit from more expensive and higher quality childcare[86].

### *4.3.2 Less well researched areas*

A systematic review in 1998 of trials exploring the effects of non-parental childcare in under-fives on health and welfare[152] found that the majority of studies explored developmental and educational effects, such as IQ and behaviour, and long term

outcomes, such as employment. It highlighted the need for further research into the impacts of childcare on children's physical health, particularly in the UK. Another review, which explored the risk of infectious disease, unintentional injury and abuse of children in childcare environments in 1991, also highlighted the potential for childcare to influence a range of physical health outcomes (including nutrition and maternal health promoting behaviours) and emphasised the need for further research in this area[91]. A more recent review (in 2010) explored the health and wellbeing effects of childcare on healthy four year olds after starting primary school, exploring aspects of health previously under-researched in the older reviews, including immunisation, injury, and obesity. The review generally found null or inconsistent effects for these measures, with the exception of childhood obesity where they concluded there to be some evidence of obesity reduction[92].

The bias towards studies of high quality group childcare and preschool settings as opposed to informal childcare types has been highlighted[85;91] and this is reflected in other reviews which aimed to examine the impacts of all types of non-parental care but could only report findings for formal childcare settings[86]. It was also highlighted that future research should explore childcare characteristics, such as size and quality[86;88].

As outlined in Chapter 2, three less researched links were selected to be explored using secondary data analysis in Phase 2: unintentional injury (providing overlap with the childcare case study), breastfeeding and overweight.

### *4.3.3 Strengths and limitations of the review of reviews*

The overarching strengths and limitations of the maps of review evidence, and the review of reviews used to produce them, were discussed in Chapter 3. The reviews identified for the childcare case study tended to focus on educational and development outcomes, long term effects, and infectious disease. There were obvious gaps in the evidence base in terms of physical health and health behaviours, although these were not necessarily highlighted as being under-researched in the reviews and commentaries. This is in contrast to the injury case study where areas requiring further research were frequently highlighted. One of the childcare reviews stated that there was a lack of research into health outcomes, but did not specify what[152]. The new review[92] added to the shortlist of reviews retrospectively, did find that there was limited evidence for physical health outcomes (although the review was investigating preschool

interventions and not other types of childcare). The association between informal childcare and health was an obvious omission in the evidence base but this was rarely noted in the reviews.

## 4.4 Summary of findings

- In 1998, the Labour Government launched a childcare strategy as part of their policy of promoting paid employment as a route out of poverty. In 2004, the 1998 strategy was replaced by a new 10-year childcare strategy, which aimed to increase the availability, flexibility, quality and affordability of childcare. This included increasing the free early years education places to all three-four year olds from 12.5 hours to 15 hours a week, extending these free places to two year olds living in deprived areas, and improving the training of childcare staff. This will continue to be the case under the new coalition government which came into power in May 2010.
- Informal childcare, and especially grandparental care, is an important part of the lives of many children, particularly in the early years and where the mother is in paid employment. The use of informal childcare (from friends, neighbours and relatives) and formal childcare (nurseries, registered childminders) has increased in recent decades, as demonstrated by data from the Infant Feeding Survey (IFS) between 2000 and 2005.
- In the MCS, 35% of infants were cared for in informal childcare (75% of informal carers were grandparents) compared to 17% in formal childcare between birth and 9 months. By the time the children were aged 3 years, this had changed to 31% and 28% respectively. Formal childcare use was socially distributed at both ages, with those with better socio-economic circumstances (SECs) being more likely to be cared for in formal childcare, whilst those from less advantaged SECs were more likely to be cared for only by a parent. There were no clear social patterns for informal childcare use.
- Reviews documenting the impact of childcare on children's health have tended to focus on formal childcare (often preschool interventions) rather than informal childcare types, in relation to educational and developmental outcomes and infectious disease. Areas which were identified as being less well researched were children's health behaviours such as physical activity and diet, unintentional injury, and parental factors including health behaviours and maternal wellbeing.

- Areas selected for further exploration in relation to childcare, using data from the Millennium Cohort Study, were: unintentional injury (providing overlap with the injury case study) (Chapter 6), breastfeeding (Chapter 7), and overweight (including obesity) (Chapter 8).

# 5 Chapter 5 – Home environment and inequalities in injury

In Chapter 2 the association between the home environment and inequalities in unintentional injuries occurring in the home was selected as one of the links in the injury case study to be explored in Phase 2. In Chapter 3, trends and inequalities in unintentional injuries (occurring anywhere) were described. The additional measures used to explore these links (i.e. the home environment and injuries *occurring in the home*) are described in this chapter and then data from the Millennium Cohort Study (MCS) are used to explore the association between the home environment and inequalities in injuries occurring in the home.

## 5.1 Objectives

- To establish trends and inequalities in injuries occurring in the home using data from the MCS and other national datasets (5.2)
- To establish trends and inequalities in aspects of the home environment using data from the MCS and other national datasets (5.3)
- To explore the home environment as a potential mediator on the pathway between socio-economic circumstances (SECs) and injuries occurring in the home, in the MCS (5.4)

## 5.2 Injuries occurring in the home: trends, prevalence and inequalities

### *5.2.1 Background*

Most injuries in preschool children occur in the home, due to the lengthy periods of time they spend there[153]. A study assessing almost 18,000 A&E injury records in west Scotland found that 85% of injuries in 0-11 month old infants and 80.1% of children aged 12-35 months occurred in the home; by the age of 60-83 months this had declined to 45.1% and injuries were also commonly occurring on footpaths and in playgrounds[120]. A European study of mortality from unintentional and intentional injuries in sixteen countries also found that the majority of injuries took place in the home[154]. Injury in infancy is primarily related to caregiver behaviour[153] with the majority of injuries being due to falls or being dropped[120]. As children get older they become capable of independently encountering situations that place them at risk[153] and injuries from other causes, such as tripping, become more frequent[120]. As mentioned previously (in Chapter 3), reducing unintentional injuries in children is a government priority and the prevention of injuries in the home features in the safety strategy for

children and young people, for example through a new national safety equipment scheme, improving the quality of social housing, and the promotion of fire safety messages[118].

### *5.2.2 Trends in injuries occurring in the home*

Currently, there appears to be little evidence pertaining to injuries occurring *in the home* in young children, particularly over time. Chapter 3 summarises trends in injuries occurring anywhere (3.2.3).

### *5.2.3 Prevalence and inequalities in injuries occurring in the home, in the MCS*

Although it is well established that the majority of injuries in young children take place in the home, there is very little routinely available data on the incidence of injuries in the home in different social groups. In the MCS, mothers reported the location of the most severe (or only) injury for which their child visited a doctor, health centre of hospital between the age of 9 months and 3 years (place of injury was not recorded between birth and 9 months). As reported previously, 35% of children had been injured during this period (Chapter 3). 21.9% (n=3151) of children had been injured in the home (almost two thirds of injuries across this period). Table 5.1 presents the percentage of children injured in the home according to SECs. Children from less advantaged SECs were significantly more likely to be injured than those from more advantaged backgrounds; for example children whose mother's had no educational qualifications were 42% more likely to be injured with a relative difference (RD) of 1.42 [1.24, 1.63]), and with an absolute difference (AD) of 7.16% (4.43, 9.89).

*Table 5.1: Children injured in the home between 9 months and 3 years in the MCS, according to SECs: weighted % (N), relative and absolute differences (95% CIs) with the most advantaged SECs group as baseline*

| | %(N) injured | Relative difference | Absolute difference |
|---|---|---|---|
| | Col A | Col B | |
| *NS-SEC* | | | |
| Routine | 25.4 (1479) | 1.33 (1.21, 1.47)* | 6.34 (4.31, 8.37)* |
| Intermediate | 20.0 (597) | 1.05 (0.94, 1.17) | 0.96 (-1.18, 3.10) |
| Managerial | 19.0 (783) | - | |
| *Education* | | | |
| No qualifications | 24.1 (569) | 1.42 (1.24, 1.63)* | 7.16 (4.43, 9.89)* |
| GCSE D-G | 24.1 (362) | 1.42 (1.24, 1.62)* | 7.12 (4.43, 9.82)* |
| GCSE A-C | 23.8 (1163) | 1.40 (1.25, 1.58)* | 6.81 (4.61, 9.01)* |
| A/AS Level | 19.9 (275) | 1.17 (1.02, 1.35)* | 2.96 (0.31, 5.62)* |
| Diploma | 21.0 (275) | 1.24 (1.07, 1.43)* | 4.01 (1.17, 6.86)* |
| Degree | 16.9 (429) | - | - |
| *Lone parenthood* | | | |
| Lone parents | 26.2 (559) | 1.23 (1.12, 1.36)* | 4.92 (2.47, 7.38)* |
| Couple families | 21.2 (2592) | - | - |
| *IMD (quintiles)^* | | | |
| Most deprived | 23.7 (649) | 1.20 (1.05, 1.37)* | 3.94 (1.09, 6.78)* |
| 2 | 22.9 (432) | 1.16 (1.01, 1.34)* | 3.20 (0.16, 6.24)* |
| 3 | 22.5 (349) | 1.14 (0.98, 1.32) | 2.72 (-0.41, 5.85) |
| 4 | 20.0 (261) | 1.02 (0.87, 1.19) | 0.31 (-2.85, 3.47) |
| Least deprived | 19.7 (243) | - | - |
| *Tenure* | | | |
| Socially rent | 26.8 (915) | 1.35 (1.24, 1.46)* | 6.90 (4.85, 8.94)* |
| Privately rent | 22.8 (254) | 1.15 (1.00, 1.31)* | 2.91 (-0.12, 5.94) |
| Own/mortgage | 19.9 (1789) | - | - |
| Other | 23.3(192) | 1.17 (1.01, 1.35)* | 3.40 (0.10, 6.70)* |

*P<=0.05; ^England only. Missing: injury in the home 56; NS-SEC 176, maternal education 31, area deprivation 2, tenure 29

Although rates have decreased in recent years, injury remains the main cause of death and morbidity in childhood in the western world [155], it is highly socially distributed and data from hospital admission data in the Trent region, UK, found that the socio-economic gradient was more marked in preschool than older children[116]. Inequalities in injuries (occurring anywhere) in early childhood were also demonstrated in Chapter 3 using data from the Millennium Cohort Study. Most injuries in preschool children occur in the home due to the lengthy periods of time they spend there[153]. Exploring their surroundings is a crucial part of children's development; however the development of their physical ability precedes their awareness of risks[153], and environments are typically designed to meet the needs of adults rather than children[156]. Young children

are therefore particularly at risk of hazards associated with lesser quality housing, which can potentially impede parents ability to keep their children safe[157].

## 5.3 Home environment: trends, prevalence and inequalities

### *5.3.1 Background*

According to the English Household Conditions Survey there were 7.7 million non-decent homes in England in 2007 (35% of the housing stock)[158]. However, privately rented accommodation and privately owned properties were more likely to be non-decent than social sector housing, which made up the majority of pre-World War One housing[158]. In the Survey of English Housing it was found that 556,000 households (2.7%) were overcrowded and that the rate of overcrowding was highest for socially rented housing[159]. As with many social determinants of health, housing quality is strongly associated with income[157], and it has been suggested that housing conditions are more proximal to injury than social conditions[109].

Minimizing the impact of inadequate housing on health was an important component in the Labour government's strategy to improve welfare and reduce health inequalities. Strategies included increasing opportunities for home ownership and grants to support renovation in the private sector[160-162], including the Green Paper "Quality and Choice: a decent home for all"[160]; improving the quality of social housing[4], including providing good quality kitchens, bathrooms, external walls, and plumbing and access to a garden[4]; ensuring that all homes have thermal comfort[163]; and reducing overcrowding (including an overcrowding action plan)[118;164]. More recently, the Marmot review raised bad housing conditions as a risk factor for poor health and emphasised the need for investment in new and existing housing stock across the social gradient but with a particular focus on poorer groups (progressive universalism)[165].

The first cross-government strategy "Staying Safe: action plan" aimed at improving the safety of children was launched by the Labour administration in 2008[118]. The national home safety equipment scheme aimed to provide home safety equipment and home safety consultations to disadvantaged families with children under the age of five (living in disadvantaged areas, and in receipt of income support or unemployment benefits)[118]. Under this scheme a wide range of safety equipment is available to each household, according to need. Typically households are provided with fire guards, safety gates, kitchen cupboard clasps, non-slip bath mats, corner cushions for furniture, and window

restrictors. Smoke alarms were not included as they fall under the remit of other schemes[166]. The "Staying Safe" action plan also emphasised the continued commitment of the Department of Communities and Local Government to make social sector homes decent and safer, and to reduce the overcrowding in support of the Overcrowding Action Plan[164].

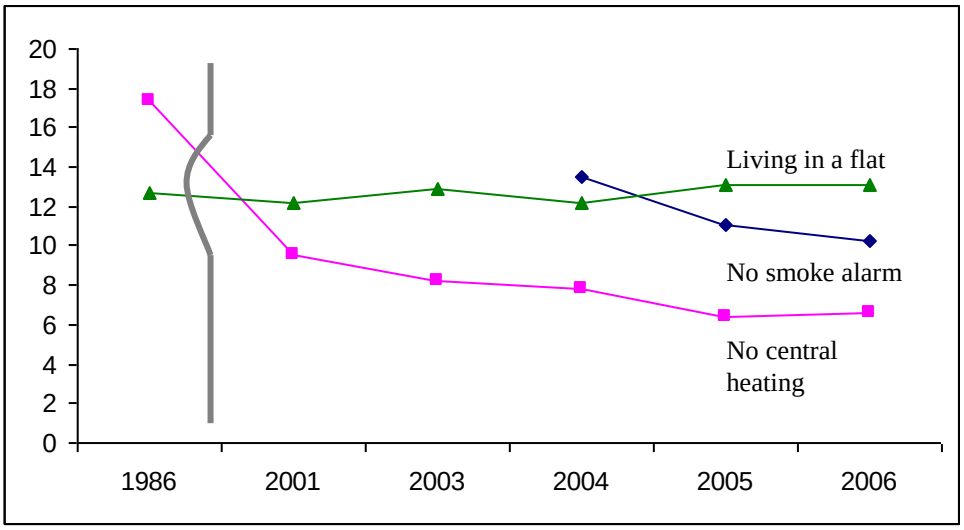
Based on the areas highlighted in the reviews in Chapter 3 and the availability of data in the MCS, the home environment is considered to be represented by both aspects of housing quality (build type, storey, rooms per capita, central heating, garden access) and safety equipment use (smoke alarms, safety gates, fire guards and electric sockets). These are all indicators or proxies for the home environment and this is discussed in more depth later on in this chapter. Trends and inequalities in these factors are now presented, using the English House Conditions Survey (EHCS), the General Household Survey (GHS) and the MCS, wherever relevant measures are available.

### *5.3.2 Trends in the home environment*

Figure 5.1 shows the proportion of households with preschool children living in a flat, without a smoke alarm, and with no central heating, in the EHCS between 1986 and 2006 (NB the x axis is not to scale). Over the twenty year period there was a dramatic decline in homes without central heating from 18% to 8%, whilst the percentage of families living in a flat remained relatively stable at 13%. Between 2004 and 2006 there was also a small drop in the proportion of households without a smoke alarm from 13% to 10% (information on smoke alarm ownership was not collected prior to this date).

Data from the GHS also demonstrates a decline in the proportion of households with preschool children that had no central heating from 5.5% to 2.3%, in Britain between 2001 and 2006. However over this same period there was a slight increase in the proportion of families living in flats (from 2.0% to 3.1%) and in households with less than one room per capita (from 6.4% to 6.7%). Whilst the direction of the trends are similar, the percentage of households living in a flat and with no central heating are lower in the GHS than the EHCS; this may be due to the different survey areas (the EHCS covers England, whereas the GHS covers Britain), sample design, or random variation.

*Figure 5.1: Percentage of households with preschool children which had no smoke alarm, no central heating or were living in flats, England 1986-2006, English House Conditions Survey*




### *5.3.3 Prevalence and inequalities in the home environment, in the MCS*

Table 5.2 shows the characteristics of households in the MCS when the children were aged 9 months (in 2001-03). As seen with the EHCS and the GHS, proportions of households with less than one room per capita was low at 9.1%. 13.2% reported living in a flat which is similar to the ECHS (approximately 12% in 2001) but higher than the GHS (only 2% lived in flats in the GHS in 2001). 9.4% of MCS children lived in homes without central heating, which again is similar to the EHCS (9% in 2001), but higher than the GHS (5.5% in 2001). There was little variation in the other measures of home environment, with the majority of MCS children living in more favourable environments. For example only 1.7% lived in home where the main living accommodation was on the third floor or above, and 10% lived in homes without sole access to a garden. The majority (82.2%) of household also reported owning a smoke alarm, which is comparable to the 86% reported in the GHS. Use of the other items of safety equipment was more heterogeneous; just half of homes had a safety gate or electric socket covers, whilst 31.1% owned a fire guard. Interpretation of the prevalence of safety equipment must be carried out with caution, since it was not possible to identify whether the safety equipment was in working order (e.g. whether smoke alarms had batteries), used or fitted properly, or necessary (for example fire guards would not be required in homes without fires).

*Table 5.2: Aspects of the home environment at age 9 months** in the MCS: Weighted % (N)*

| **Measures of the home environment**** | **% (N)** |
|---|---|
| **Housing quality** | |
| *Building type* | |
| House/bungalow | 86.9 (12,557) |
| Flat/bedsit/room/other | 13.2 (1802) |
| *Storey of main living space* | |
| Ground floor | 90.8 (13099) |
| Basement | 0.4 (47) |
| First-second floor | 7.2 (963) |
| Third floor and higher | 1.7 (269) |
| *Rooms per capita^^* | |
| <1 | 9.1 (1514) |
| 1-<2 | 70.5 (9995) |
| 2+ | 20.5 (2903) |
| *Central heating* | |
| Yes | 90.6 (13052) |
| No | 9.4 (1359) |
| *Access to garden* | |
| Yes, sole | 86.4 (12478) |
| Yes, shared | 3.6 (515) |
| No | 10.0 (1420) |
| *Damp/condensation* | |
| No | 86.4 (12491) |
| Yes | 13.7 (1911) |
| **Safety equipment use** | |
| *Fireguard* | |
| No | 68.9 (9862) |
| Yes | 31.1 (4548) |
| *Safety gate* | |
| No | 44.1 (6701) |
| Yes | 55.9 (7709) |
| *Electric socket covers* | |
| No | 45.8 (6995) |
| Yes | 54.2 (7415) |
| *Smoke alarm* | |
| No | 17.9 (2526) |
| Yes | 82.2 (11,884) |

^^ excluding bathrooms, toilets, halls and garages
** all aspects of the home environment were captured at 9 months
Missing: build 75; storey 56; rooms 22; central heating 23; garden 21; damp 32; home safety equipment 24

Table 5.3 demonstrates inequalities in aspects of the home environment. All aspects of the home environment were socially distributed for all SECs measures, with children from less advantaged SECs tending to be significantly more likely to live in poorer quality home environments. For example the relative difference (RD) for living in

homes with living accommodation not on the ground floor was 8.46 for children living in socially rented accommodation compared to owned/mortgaged homes and the AD was 22.25%. Lone parents were less likely to live in homes with less than one room per capita, although this is probably due to there being fewer adults in the household. Children living in the most deprived areas in England were more than three times more likely to live in a home without central heating than children living in the most advantaged areas (RD=3.51 [2.66, 4.62]); with an absolute difference of 11.60% (9.70, 13.50). The RD for living in a home without a garden was 3.36 (2.54, 4.43) for those whose mothers had no educational qualifications (compared to those with a degree) and the AD was 15.68% (12.02, 19.34).

Table 5.4 demonstrates inequalities in safety equipment use. Children from less advantaged backgrounds were more likely to live in households with less quality home environments. For example children living in the most deprived areas were more likely to not use safety gates (RD= 1.63 [1.49, 1.77], AD=21.09% [17.75, 24.43]) and fireguards (RD=1.09 [1.04, 1.14]; AD=5.97% [2.80, 9.15]) than those in the least deprived areas. Children whose mothers had no educational qualifications were almost twice as likely to live in homes without electric socket covers (RD=1.95 [1.79, 2.11]), with an absolute difference of 31.01% (27.17, 34.84). Mothers from routine & manual backgrounds were more likely to not own a smoke alarm (RD=1.83 [1.60, 2.10]; AD=9.34% [7.31, 11.36]).

*Table 5.3: Aspects of the home environment at age 9 months** in the MCS, according to SECs: weighted % (N), absolute and relative differences (95% CIs), with the most advantaged SECs group as baseline*

| | **Build type[a]** | | | **Storey[b]** | | | **Rooms[c]** | | |
|---|---|---|---|---|---|---|---|---|---|
| | N (%) | Relative | Absolute difference | N (%) | Relative difference | Absolute difference | N (%) | Relative | Absolute difference |
| *NS-SEC* | | | | | | | | | |
| Routine | 17.7 (898) | 2.42 (1.97, 2.98) * | 10.39 (8.09, 12.69)* | 12.4 (630) | 2.55 (2.04, 3.18) * | 7.56 (5.83, 9.29)* | 87.7 (5088) | 1.33 (1.28, 1.37) * | 21.64 (19.40, 23.87)* |
| Intermediate | 10.7 (326) | 1.46 (1.19, 1.80) * | 3.38 (1.59, 5.18)* | 7.3 (233) | 1.50 (1.18, 1.90) * | 2.43 (1.04, 3.82)* | 79.3 (2397) | 1.20 (1.16, 1.24)* | 13.24 (10.92, 15.56)* |
| Managerial | 7.3 (333) | - | - | 4.9 (222) | - | - | 66.1 (2708) | - | - |
| *Education* | | | | | | | | | |
| No qualifications | 19.6 (420) | 2.60 (1.89, 3.57) * | 12.08 (8.04, 16.11)* | 14.7 (315) | 2.94 (2.06, 4.22) * | 9.68 (6.55, 12.82)* | 90.6 (2245) | 1.44 (1.37, 1.50) * | 27.58 (24.62, 30.55)* |
| GCSE D-G | 14.8 (207) | 1.96 (1.39, 2.75) * | 7.23 (3.72, 10.74)* | 10.2 (417) | 2.04 (1.39, 3.01) * | 5.20 (2.46, 7.94)* | 86.8 (1305) | 1.38 (1.32, 1.44) * | 23.83 (20.61, 27.05)* |
| GCSE A-C | 13.1 (578) | 1.74 (1.30, 2.34) * | 5.58 (3.05, 8.11)* | 8.9 (393) | 1.80 (1.28, 2.51) * | 3.96 (2.07, 5.86)* | 82.7 (4011) | 1.31 (1.26, 1.37) * | 19.71 (16.94, 22.48)* |
| A/AS Level | 11.3 (156) | 1.50 (1.11, 2.04) * | 3.80 (1.02, 6.57)* | 7.5 (107) | 1.51 (1.05, 2.15) * | 2.52 (0.37, 4.66)* | 75.6 (1085) | 1.20 (1.14, 1.27) * | 12.66 (8.81, 16.51)* |
| Diploma | 10.3 (140) | 1.36 (1.04, 1.77) * | 2.72 (0.45, 4.99)* | 7.7(102) | 1.54 (1.10, 2.15) * | 2.67 (0.62, 4.73)* | 74.0 (974) | 1.17 (1.12, 1.24) * | 10.99 (7.49, 14.50)* |
| Degree | 7.5 (220) | - | - | 5.0 (149) | - | | 63.0 (1159) | - | - |
| *Lone parenthood* | | | | | | | | | |
| Lone parents | 26.9 (508) | 2.48 (2.16, 2.85) * | 16.08 (12.25,19.92)* | 18.9 (363) | 2.49 (2.10, 2.94) * | 11.31 (8.26, 14.35)* | 72.3 (1574) | 0.89 (0.86, 0.93) * | -8.49 (-11.57, -5.41)* |
| Couple families | 10.9(1294 | - | - | 7.6 (916) | - | | 80.7 (9935) | - | - |
| *IMD (quintiles)^* | | | | | | | | | |
| Most deprived | 22.2 (613) | 5.23 (3.89, 7.02) * | 17.93 (15.81, 20.05)* | 17.5 (492) | 6.99 (4.75, 10.27) | 15.03 (13.18, 16.89)* | 88.5 (2614 ) | 1.27 (1.23, 1.33) * | 2.41 (-1.16, 5.99) |
| 2 | 15.7 (290) | 3.70 (2.72, 5.03) * | 11.43 (9.23, 13.64)* | 11.5 (211) | 4.56 (3.06, 6.81) * | 8.95 (7.07, 10.83)* | 87.0 (1715) | 1.25 (1.20, 1.31) * | 11.18 (7.90, 14.46)* |
| 3 | 10.9 (154) | 2.58 (1.86, 3.57) * | 6.70 (4.59, 8.81)* | 6.9 (97) | 2.73 (1.78, 4.18) * | 4.33 (2.64, 6.03)* | 80.6 (1301) | 1.16 (1.11, 1.21) * | 17.65 (14.62, 20.68)* |
| 4 | 6.0 (67) | 1.41 (0.97, 2.04) | 1.73 (-0.14, 3.59) | 3.7 (42) | 1.46 (0.90, 2.37) | 1.17 (-0.30, 2.63) | 71.8 (925 ) | 1.03 (0.98, 1.09) | 19.07 (16.18, 21.96)* |
| Least deprived | 4.2 (46) | - | - | 2.5 (27) | - | | 69.4 (850) | - | - |
| *Tenure* | | | | | | | | | |
| Other | 7.2 (59) | 1.53 (1.06, 2.22)* | 2.51 (0.06, 4.96)* | 5.1 (41) | 1.70 (1.09, 2.66)* | 2.09 (-0.01, 4.19) | 91.8 (784) | 1.23 (1.19, 1.27)* | 17.17 (14.58, 19.76)* |
| Privately rent | 19.8 (109) | 4.21 (3.39, 5.24)* | 15.13 (11.40, 18.86)* | 13.5 (136) | 4.53 (3.56, 5.76)* | 10.52 (7.77, 13.28)* | 80.7 (887) | 1.08 (1.04, 1.12)* | 5.99 (2.91, 9.08)* |
| Socially rent | 34.6 | 7.36 (5.86, 9.24)* | 29.92 (24.70, 35.14)* | 25.2 (813) | 8.46 (6.53, 10.97)* | 22.25 (18.04, 26.47)* | 89.1 (3074) | 1.19 (1.16, 1.23)* | 14.41 (12.16, 16.66)* |
| Own/mortgage | 4.7 (457) | - | | 3.0 (288) | - | | 74.7 (6757) | - | - |

| | Central heating[d] | | | Damp[e] | | | Garden[f] | | |
|---|---|---|---|---|---|---|---|---|---|
| | N (%) | Relative difference | Absolute difference | N (%) | Relative difference | Absolute difference | N (%) | Relative difference | Absolute difference |
| *NS-SEC* | | | | | | | | | |
| Routine | 13.0 (710) | 2.75 (2.28, 3.33) * | 8.26 (6.53, 9.99)* | 17.2 (934) | 1.90 (1.63, 2.22)* | 8.17 (6.51, 9.84)* | 18.5 (961) | 2.63 (2.19, 3.15) * | 11.44 (9.12, 13.76)* |
| Intermediate | 7.1 (212) | 1.51 (1.25, 1.83) * | 2.41 (1.21, 3.62)* | 10.8 (311) | 1.19 (1.00, 1.42)* | 1.75 (-0.03, 3.53) | 10.0 (321) | 1.42 (1.18, 1.71) * | 2.97 (1.39, 4.56)* |
| Managerial | 4.7 (184) | - | - | 9.1 (358) | | - | 7.0 (323) | - | - |
| *Education* | | | | | | | | | |
| No qualifications | 16.3 (406) | 3.95 (2.94, 5.31) * | 12.14 (8.62, 15.66)* | 20.5 (465) | 2.00 (1.65, 2.42)* | 10.25 (7.64, 12.85)* | 22.3 (504) | 3.36 (2.54, 4.43) * | 15.68 (12.02, 19.34)* |
| GCSE D-G | 13.2 (196) | 3.21 (2.46, 4.20) * | 9.10 (6.64, 11.55)* | 16.0 (248) | 1.57 (1.26, 1.95)* | 5.79 (3.00, 8.58)* | 17.4 (250) | 2.62 (1.93, 3.55) * | 10.75 (7.25, 14.26)* |
| GCSE A-C | 9.0 (428) | 2.19 (1.74, 2.76) * | 4.88 (3.47, 6.29)* | 12.9 (601) | 1.26 (1.05, 1.51)* | 2.68 (0.68, 4.69)* | 12.8 (579) | 1.93 (1.48, 2.52) * | 6.17 (3.93, 8.40)* |
| A/AS Level | 9.3 (126) | 2.26 (1.67, 3.06) * | 5.19 (3.02, 7.35)* | 11.2 (148) | 1.10 (0.89, 1.36) | 1.00 (-1.29, 3.29) | 10.9 (161) | 1.64 (1.24, 2.18) * | 4.26 (1.85, 6.67)* |
| Diploma | 5.4 (67) | 1.31 (0.97, 1.76) | 1.26 (-0.20, 2.71) | 10.5 (134) | 1.02 (0.80, 1.31) | 0.25 (-2.27, 2.78) | 10.2 (140) | 1.53 (1.16, 2.02) * | 3.54 (1.27, 5.80)* |
| Degree | 4.1 (102) | - | - | 10.2 (248) | - | - | 6.7 (203) | - | - |
| *Lone parenthood* | | | | | | | | | |
| Lone parents | 14.4 (298) | 1.68 (1.45, 1.95) * | 5.83 (3.78, 7.89)* | 18.9 (381) | 1.48 (1.31, 1.68)* | 6.15 (4.07, 8.24)* | 27.9 (556) | 2.49 (2.21, 2.80) * | 16.70 (13.29, 20.10)* |
| Couple families | 8.6 (1061) | - | - | 12.8 (1530) | - | - | 11.2(1379) | - | |
| *IMD (quintiles)*^ | | | | | | | | | |
| Most deprived | 16.2 (513) | 3.51 (2.66, 4.62) * | 11.60 (9.70, 13.50)* | 21.1 (597) | 2.45 (2.01, 3.00)* | 12.47 (10.16, 14.79)* | 26.8 (767) | 6.22 (4.65, 8.31) * | 22.52 (20.33, 24.72)* |
| 2 | 10.3 (188) | 2.22 (1.65, 2.99) * | 5.66 (3.73, 7.58)* | 15.4 (294) | 1.79 (1.44, 2.23)* | 6.79 (4.40, 9.17)* | 17.9 (329) | 4.13 (3.06, 5.59) * | 13.53 (11.25, 15.80)* |
| 3 | 9.8 (138) | 2.12 (1.56, 2.89) * | 5.19 (3.16, 7.22)* | 15.2 (233) | 1.77 (1.41, 2.21)* | 6.58 (4.11, 9.06)* | 11.1 (159) | 2.57 (1.86, 3.55) * | 6.78 (4.66, 8.91)* |
| 4 | 6.9 (82) | 1.50 (1.07, 2.10) * | 2.31 (0.41, 4.21)* | 10.3 (125) | 1.20 (0.93, 1.54) | 1.69 (-0.65, 4.03) | 5.4 (64) | 1.26 (0.86, 1.82) | 1.10 (-0.70, 2.90) |
| Least deprived | 4.6 (55) | - | - | 8.6 (106) | - | - | 4.3 (47) | - | - |
| *Tenure* | | | | | | | | | |
| Other | 12.5 (98) | 1.94 (1.52, 2.48)* | 6.31 (4.04, 8.57)* | 11.5 (99) | 1.37 (1.06, 1.79)* | 3.13 (0.28, 5.98)* | 12.7 (113) | 2.52 (1.97, 3.23)* | 7.64 (4.95, 10.34)* |
| Privately rent | 20.6 (223) | 3.20 (2.65, 3.88)* | 14.16 (10.22, 18.10)* | 26.5 (265) | 3.18 (2.71, 3.74)* | 18.20 (14.92, 21.48)* | 29.4 (303) | 5.87 (4.94, 6.98)* | 24.43 (20.48, 28.37)* |
| Socially rent | 12.7 (456) | 1.98 (1.61, 2.44)* | 6.05 (3.41, 8.69)* | 23.9 (781) | 2.86 (2.50, 3.28)* | 15.55 (13.26, 17.84)* | 31.1 (1019) | 6.24 (5.02, 7.77)* | 26.30 (21.46, 31.13)* |
| Own/mortgage | 6.4 (581) | - | | 8.3 (766) | - | - | 5.0 (499) | - | - |

*p<=0.05 ^ England only ** All measures were taken at 9 months.

[a] Build type: Living in a flat, bedsit or other baseline house or bungalow. [b] Storey: Main living accommodation in basement or first floor and above, baseline ground floor [c] Rooms excluding bathrooms, toilets, halls and garages: Having less than one room per capita, baseline one or more rooms per capita- this cut-off was used in order to capture households with the most limited space. [d] Central heating: Other forms of heating, baseline central heating. [e] Damp: Experiencing damp or condensation, baseline no damp/condensation. [f] Garden: Having shared or no access to a garden, baseline sole access- this categorisation was used as shared access would be less likely to indicate direct access and therefore not add to the home environment (for example through providing additional space). [g] P value for Wald test for trend was <0.001 for all analyses except for maternal education, where p=0.015

Missing: injury in the home 56; NS-SEC 176, maternal education 31, area deprivation 1, tenure 29; build 75; storey 56; rooms 22; central heating 23; garden 21; damp 32

*Table 5.4: Safety equipment use at age 9 months in the MCS, according to SECs: weighted % (N) (of not using equipment), and relative and absolute differences (95% CIs), with the most advantaged SECs group as baseline*

| | **No safety gate** | | | **No fire guard** | | |
|---|---|---|---|---|---|---|
| | N (%) | *Relative difference* | *Absolute difference* | N (%) | Relative difference | Absolute difference |
| *NS-SEC* | | | | | | |
| Managerial | 40.9 (1738) | - | - | 65.6 (2656) | - | - |
| Intermediate | 41.2 (1304) | 0.98 (0.93, 1.04) | -0.74 (-3.14, 1.67) | 69.4 (2103) | 1.06 (1.02, 1.10)* | 3.84 (1.08, 6.60) |
| Routine | 44.9 (2723) | 1.10 (1.04, 1.16)* | 3.98 (1.55, 6.42) | 69.5 (4004) | 1.06 (1.02, 1.10)* | 3.97 (1.38, 6.57) |
| *Mated* | | | | | | |
| Degree | 39.8 (1036) | - | - | 64.3 (1582) | - | - |
| Diploma | 36.8 (515) | 0.92 (0.83, 1.02) | -3.26 (-7.18, 0.65) | 65.6 (871) | 1.02 (0.96, 1.08) | 1.29 (-2.57, 5.15) |
| A/AS Level | 43.1 (642) | 1.08 (0.98, 1.20) | 3.31 (-0.83, 7.45) | 66.8 (941) | 1.04 (0.98, 1.10) | 2.49 (-1.19, 6.16) |
| GCSE A-C | 43.4 (2188) | 1.09 (1.02, 1.17)* | 3.60 (0.78, 6.41) | 69.4 (3323) | 1.08 (1.03, 1.14)* | 5.12 (1.75, 8.49) |
| GCSE D-G | 40.9 (657) | 1.03 (0.94, 1.12) | 1.08 (-2.47, 4.62) | 70.9 (1067) | 1.10 (1.03, 1.18)* | 6.61 (2.25, 10.98) |
| No qualifications | 55.4 (1419) | 1.39 (1.29, 1.50)* | 15.58 (12.05, | 72.7 (1779) | 1.13 (1.07, 1.19)* | 8.36 (4.60, 12.13) |
| *Lone parenthood* | | | | | | |
| Couple families | 42.3 (5157) | | - | 67.8 (8242) | - | - |
| Lone parents | 55.2 (124) | 1.31 (1.24, 1.38)* | 12.97(10.12,15.82), | 74.9 (1620) | 1.10 (1.06, 1.14)* | 7.05 (4.39, 9.71) |
| *IMD (quintiles)*^ | | | | | | |
| Least deprived | 33.6 (418) | - | - | 67.2 (826) | - | - |
| 4 | 37.1 (484) | 1.10 (0.99, 1.23) | 3.44 (-0.34, 7.23) | 65.2 (842) | 0.97 (0.92, 1.02) | -2.09 (-5.82, 1.63) |
| 3 | 42.4 (684) | 1.26 (1.14, 1.39)* | 8.80 (5.10, 12.51)* | 70.5 (1146) | 1.05 (1.00, 1.10)* | 3.24 (-0.29, 6.77) |
| 2 | 43.0 (870) | 1.28 (1.16, 1.41)* | 9.35 (5.77, 12.93)* | 72.5 (1434) | 1.08 (1.03, 1.13)* | 5.21 (1.82, 8.60) |
| Most deprived | 54.7 (1684) | 1.63 (1.49, 1.77)* | 21.09 (17.75, | 73.2 (2155) | 1.09 (1.04, 1.14)* | 5.97 (2.80, 9.15) |
| *Tenure* | | | | | | |
| Own/mortgage | 39.5 (3793) | - | - | 65.8 (602) | - | - |
| Socially rent | 51.5 (1831) | 1.30 (1.23, 1.38)* | 12.00 (9.26, 14.74) | 76.8 (755) | 1.17 (1.12, 1.21)* | 11.01 (8.13, 13.89) |
| Privately rent | 46.9 (550) | 1.19 (1.09, 1.30)* | 7.41 (3.32, 11.51) | 69.5 (2593) | 1.06 (1.00, 1.12)* | 3.77 (0.08, 7.46) |
| Other | 60.3 (521) | 1.53 (1.42, 1.64)* | 20.77 (16.48, | 69.5 (5905) | 1.06 (1.00, 1.12)* | 3.72 (-0.19, 7.62) |

| | No electric socket covers | | | No smoke alarm | | |
|---|---|---|---|---|---|---|
| | N (%) | Relative | Absolute difference | N (%) | Relative difference | Absolute difference |
| *NS-SEC* | | | | | | |
| Managerial | 36.3 (1554) | - | | 11.2 (431) | - | |
| Intermediate | 41.3 (1334) | 1.14 (1.06, 1.23)* | 5.07 (2.12, 8.02)* | 14.0 (418) | 1.25 (1.06, 1.46) * | 2.77 (0.77, 4.77)* |
| Routine | 51.1 (3083) | 1.41 (1.32, 1.50)* | 14.78 (12.21, 17.35)* | 20.6 (1113) | 1.83 (1.60, 2.10) * | 9.34 (7.31, 11.36)* |
| *Mated* | | | | | | |
| Degree | 32.8 (878) | | | 12.0 (283) | - | |
| Diploma | 36.5 (514) | 1.11 (1.01, 1.23)* | 3.67 (0.27, 7.07)* | 11.8 (153) | 0.99 (0.81, 1.20) | -0.18 (-2.55, 2.20) |
| A/AS Level | 41.8 (663) | 1.28 (1.17, 1.40)* | 9.04 (5.61, 12.47)* | 12.4 (185) | 1.03 (0.85, 1.24) | 0.37 (-1.92, 2.66) |
| GCSE A-C | 45.3 (2281) | 1.38 (1.28, 1.49)* | 12.56 (9.75, 15.37)* | 15.8 (727) | 1.31 (1.14, 1.51) * | 3.78 (1.92, 5.63)* |
| GCSE D-G | 50.4 (794) | 1.54 (1.41, 1.68)* | 17.60 (13.89, 21.31)* | 21.7 (318) | 1.81 (1.53, 2.14) * | 9.67 (6.82, 12.53)* |
| No qualifications | 63.8 (1649) | 1.95 (1.79, 2.11)* | 31.01 (27.17, 34.84)* | 31.3 (734) | 2.61 (2.25, 3.03) * | 19.34 (16.24, 22.44)* |
| *Lone parenthood* | | | | | | |
| Couple families | 43.3 (5624) | | | 16.5 (2030) | - | |
| Lone parents | 60.5 (1371) | 1.40 (1.33, 1.47)* | 17.22 (14.39, 20.05)* | 25.6 (496) | 1.54 (1.39, 1.72)* | 9.02 (6.46, 11.58)* |
| *IMD (quintiles)*^ | | | | | | |
| Least deprived | 31.8 (392) | | | 10.4 (129) | | |
| 4 | 38.5 (494) | 1.21 (1.09, 1.35)* | 6.73 (2.95, 10.51)* | 12.8 (157) | 1.23 (0.98, 1.53) | 2.38 (-0.20, 4.96) |
| 3 | 44.0 (771) | 1.38 (1.25, 1.53)* | 12.17 (8.48, 15.85)* | 17.3 (273) | 1.65 (1.35, 2.02)* | 6.82 (4.17, 9.47)* |
| 2 | 49.4 (997) | 1.55 (1.41, 1.71)* | 17.64 (14.07, 21.20)* | 22.5 (466) | 2.16 (1.79, 2.60)* | 12.08 (9.42, 14.74)* |
| Most deprived | 38.5 (1860) | 1.93 (1.77, 2.11)* | 29.71 (26.42, 33.01)* | 33.7 (1044) | 3.23 (2.71, 3.85)* | 23.27 (20.70, 25.85)* |
| *Tenure* | | | | | | |
| Own/mortgage | 38.6 (533) | | | 13.0 (237) | - | - |
| Socially rent | 57.6 (642) | 1.49 (1.42, 1.57)* | 18.99 (16.41, 21.57)* | 24.1 (323) | 1.85 (1.62, 2.12)* | 11.09 (8.16, 14.03)* |
| Privately rent | 56.4 (2095) | 1.46 (1.37, 1.56)* | 17.85 (14.28, 21.42)* | 30.0 (775) | 2.28 (2.01, 2.59)* | 16.64 (13.23, 20.05)* |
| Other | 61.4 (3720) | 1.59 (1.47, 1.72)* | 22.80 (18.38, 27.21)* | 28.4 (1188) | 2.18 (1.89, 2.52)* | 15.41 (11.49, 19.33)* |

*P<=0.05. ^ England only. Missing: all equipment types- 24.

## 5.4 Exploring the home environment in relation to inequalities in injuries

### *5.4.1 Background*

It has been hypothesised that the higher rates of injury in lone parent families is in part explained by lesser quality housing conditions[77]. An ecological study in the US found that housing features (owner occupancy and age of building) mediated the association between area level poverty and hospital admissions due to falls and burns in children under the age of six years. The authors highlighted the need for individual-level studies to explore this further[109]. Two UK studies investigated individual, family and area-level predictors of childhood injury, including measures of socio-economic background and the home environment, with contrasting results. Whilst one of these studies found that, after adjustment, aspects of the home environment (such as build and garden access) and safety equipment use were not predictors of injuries[23], the other found that tenure, family size and safety equipment use were[24]. However neither study limited their analyses to injuries occurring only in the home, or set out to specifically explore the home environment as a mediator between family socio-economic circumstances and injury. There is some evidence to suggest that home safety interventions can reduce disparities in home safety practices[167], although a recent review concluded that there is weak evidence to suggest that interventions to increase safety equipment use reduce the risk of childhood injuries. Furthermore, although there are dramatic socio-economic disparities in childhood injury, there is little research exploring the impact of safety equipment use on injury in different social groups[84].

The following section describes the methods and results from an analysis exploring the home environment as a potential mediator between SECs and injuries, using longitudinal data.

### *5.4.2 Methods*

**Measures**

Socio-economic circumstances (at 9 months)

Measures of SECs were taken from the first sweep. In this chapter tenure is also explored as a measure of SECs, alongside the other four measures identified in Chapter 2 and presented in Chapter 3 (NS-SEC, maternal education, lone parenthood and area deprivation). Whilst tenure is closely related to other measures of socio-economic status, such as area deprivation and NS-SEC, it captures other aspects of SECs which

those measures cannot, such as level of control over the home environment. Tenure is also known to be associated with housing quality[168], safety equipment use[167] and injuries[24]. It is therefore possible that aspects of the home environment might lie on the causal pathway between tenure and injuries occurring in the home, as postulated for the other SECs measures.

Home environment (at 9 months)

The home environment was taken to be represented by housing quality and safety equipment use, again measured at age 9 months. As outlined in Chapter 2, a number of measures are available in the MCS to represent these different aspects of the home environment, although they are not sufficient to encompass the whole of the home environment. They are therefore taken to be proxies. Similarly whilst the safety equipment reported in the MCS are likely to only prevent certain injuries (and may not be relevant to all households), they may be considered a proxy for safety equipment provision in the home.

An assessment tool is available for scoring homes with young children according to level of safety and hazards[169], and its use has been recommended for health visitors, other professionals and parents in NICE guidance[170]. This questionnaire captures a wide range of information including tenure, build type, rooms per capita, heating type, garden access and the use of fireguards, smoke alarms and stair gates, all measures which are included in the MCS. Other factors assessed (which are not available in the MCS) include the use of fire blankets, baby walkers, window locks or restrictors and carbon monoxide monitors, the presence of hazards within reach of children, such as medicines, cleaning products and candles, and exposed wires or cables[169]. Information from the questionnaire is used to score homes based on the number of safe features and hazards as a percentage of all potential safety features and hazards. In this chapter a similar score was created, based on the relevant information available in the MCS, as detailed below:

*Housing score assigned to each housing feature (collected at 9 months)*

A value of 2 was assigned to a 'negative feature', 1 moderate (where relevant), and 0 none. Giving a maximum score of 12 (households with the most negative features). This

scoring system was used in order to better exploit the data in variables which were not binary (for example garden access).

- Rooms per capita: less than one =2; one to less than two=1; two or more =0
- Build type: Bedsit/other=2; flat=1; house/bungalow=0
- Storey: Third floor or above=2; first/second floor/basement=1; Ground floor=0
- Garden: No access=2; shared access=1; sole access=0
- Central heating: No=2; yes=0
- Presence of damp or condensation on walls: Yes=2; no=0

These values were then totalled to create a housing score, with a maximum of 12. Two thirds of households scored 0 or 1; therefore the score was collapsed into 0; 1; 2-3; 4-5 and 6+ for the majority of analyses. In the main regression model (Table 5.7) this variable was entered as categorical. For the analyses exploring the social distribution of housing characteristics (Table 5.5) a binary variable was created. The score was arbitrarily divided into 0-3 and 4+ (adverse); this cut-off was chosen based on variability in the data (since the majority of households had scores of 0 or 1 there would have been insufficient power to use a higher threshold for adverse housing). Table 5A1a in Appendix 5 shows the distribution of these scores.

*Safety equipment use (collected at 9 months)*

A value of 0 was assigned to households that reported using the following four types of safety equipment, and 1 to those which did not:

- Safety gates: use=0; do not use=1
- Fire guards: use =0; do not use =1
- Electric socket covers: use =0; do not use =1
- Smoke alarms: use =0; do not use =1

The score ranged from 0 (for households with all pieces of safety equipment) to 4 (for households which used none of the reported of equipment). Table 5A1b in Appendix 5 shows the distribution of these scores. In the main regression model (Table 5.7) this variable entered as categorical. For the analyses exploring the social distribution of safety equipment use (Table 5.5) a binary variable was created: 0-2 and 3-4 (‘adverse’). This was based on variability in the data and also in an attempt to allow for the fact that not all pieces of equipment would be relevant to all households (for example a score of 2 in households without an open fire and stairs could still indicate higher levels of safety equipment use).

Injuries occurring in the home (between 9 months and 3 years)

Injuries for which the child had visited a doctor, health centre or hospital, and that had occurred between the age of 9 months and 3 years (therefore maximising the likelihood that injuries proceeded SECs and the home environment), were explored. Mothers were asked to report the location of the most severe (or only) injury and this was used to classify children as having been injured in the home, or not. Those who were injured more than once and reported the most severe injury as occurring outside the home were classified as not having been injured in the home.

Confounders

In the adjusted analyses, the number of children in the family, maternal age at first live birth, ethnicity, and main childcare between 9 months and 3 years were controlled for, because they were identified as potential confounders, or a risk factor for injury, in other analyses (Chapter 6).

**Participants**

The analyses presented in this chapter used data from the first and second sweeps and therefore included 14,434 children who took part in both sweeps. Of these, 14,378 (99.6%) children had information on whether they had been injured between the age of 9 months and 3 years, and where the most severe (or only) injury had taken place. Information on SECs and the home environment measured at the first sweep were employed, in order to capture a longitudinal impact on injury.

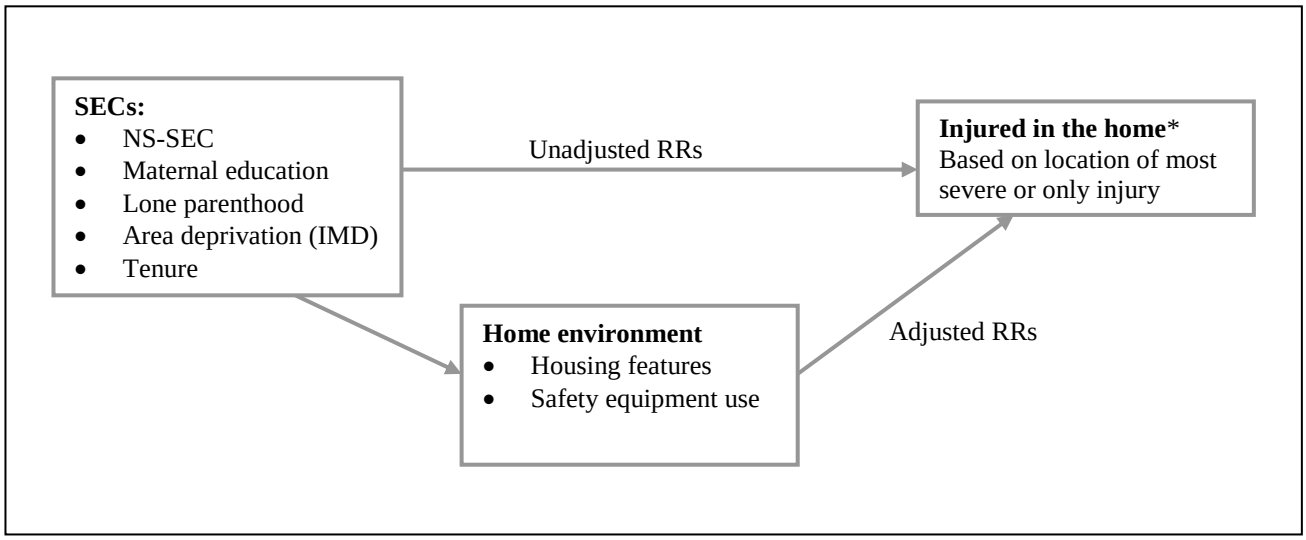
There was no significant difference in the risk of injury at age 9 months between children who did not respond to the second sweep and those who did, with an un-weighted absolute difference (in injury rates) of 0.48% (95% CI: -0.52, 1.47%). However those who were not included in the second sweep were significantly more likely to live in a flat or bedsit, in a basement or on a higher floor, have fewer rooms per capita, and were less likely to have access to a garden (P=<0.05) than those who were included in the second sweep.

**Analysis**

As pointed out in Chapter 2, two approaches to exploring the impact of policies on inequalities in health are used in this thesis. The first approach is used in this chapter,

which explores whether the home environment lies on the casual pathway between socio-economic status and unintentional injury. This approach is demonstrated diagrammatically in Figure 5.2.

*Figure 5.2: Diagram to demonstrate the approach used for the analysis exploring the home environment as a potential mediator between SECs and injuries*




The analysis was conducted in several stages:

*Unadjusted association between SECs and the home environment (Table 5.5)*

This was explored using Poisson regression. Inequalities in different aspects of the home environment have been presented earlier in the chapter (using RDs and ADs) but are repeated in Table 5.5, this time presenting the housing quality and safety equipment scores, and including figures for tenure as an additional measure of SECs. In Table 5.5 inequalities are presented as risk ratios (RRs) because this is how they will be entered into the model in later stages of the analysis.

*Unadjusted association between the home environment and injuries occurring in the home (Table 5.6)*

Unadjusted RRs and 95% confidence intervals (CI) for being injured were estimated, using Poisson regression, for each individual aspect of housing and safety equipment and also for the housing and safety equipment scores.

*Unadjusted association between SECs and injuries occurring in the home (Table 5.7, column B)*

Inequalities in injuries occurring in the home (represented by RDs and ADs) are presented earlier in this chapter for the four main measures of SECs (Table 5.1). Risk ratios are presented here a second time, firstly to document inequalities in injury according to tenure in addition to the other four measures of SECs, and secondly to allow comparison of the social distribution of injuries both before and after adjustment for the home environment (see next stage of analysis below).

*Association between SECs and injuries in the home, adjusting for the home environment (Table 5.7, columns C and D)*

Finally the housing and safety equipment scores were entered into the model (as categorical variables) exploring the association between SECs and injury, as potential mediators. These were entered in two blocks; first, aspects of housing, followed by safety equipment use. A significant change in the risk ratios (of around 10% or more) would be considered to be potential mediation.

*Association between SECs and injuries in the home, adjusting for potential confounders (Table 5.7, column E)*

The following measures were controlled for: maternal age at birth of cohort child, maternal ethnicity, the number of children living in the household at 9 months, and main non-parental childcare type between 9 months and 3 years.

*Sensitivity analyses (Appendix 5, tables 5A2-5A4)*

A number of sensitivity analyses were also carried out to address some of the limitations of the data. These are presented in detail in Appendix 5, but are described briefly in the results section of this chapter.

### *5.4.3 Results*

22% of children had been injured at home since the age of 9 months, and 7% of these had been hospitalised as a result (data not shown). 14% had been injured somewhere outside the home and 23% of these had been injured more than once. The type of injuries ranged from broken bones to a swallowed object. The most common was a "bang on the head" (not leading to unconsciousness) (one third).

**Unadjusted association between SECs and the home environment**

As discussed in this chapter, children from less advantaged groups tended to live in less favourable housing compared to those from the most advantaged groups. For example households were more than six times as likely to have an adverse housing score (of 4 or more) (RR=6.41 [4.85, 8.46]) if they were in the most deprived areas in England, compared to those living in the least deprived areas (Table 5.5). Households where the mother had no educational qualifications were more than twice as likely to have adverse safety score than mothers with a degree (RR=2.08 [1.86, 2.32]). This is also demonstrated in Table 5.1, where children from less advantaged SECs were more likely to live in households with more negative features (classified as housing scores of 4 or more), and to have lower (or more adverse) safety scores (owning one piece of equipment or less).

*Table 5.5: Risk ratios (and 95% CIs) for living in homes with adverse housing and safety scores in the MCS, according to SECs:*

| | **Adverse housing score – Score of 4 or more (4 'adverse' housing features or more)** | | **Adverse safety score- Score of 3 or 4 (own 0-1 types of reported equipment)** | |
|---|---|---|---|---|
| | % (N) | RR (95% CI) | % (N) | RR (95% CI) |
| *NS-SEC* | | | | |
| Routine | 20.7 (1,078) | 3.09 (2.57, 3.73)* | 31.6 (1,874) | 1.11 (1.01, 1.23)* |
| Intermediate | 10.9 (337) | 1.64 (1.36, 1.96)* | 25.5 (820) | 1.38 (1.26, 1.50)* |
| Managerial | 6.7 (292) | - | 23.0 (943) | - |
| *Education* | | | | |
| No qualifications | 26.6 (621) | 4.12 (3.17, 5.36)* | 44.9 (1,139) | 2.08 (1.86, 2.32)* |
| GCSE D-G | 18.2 (275) | 2.82 (2.09, 3.82)* | 31.6 (492) | 1.46 (1.30, 1.64)* |
| GCSE A-C | 14.6 (646) | 2.25 (1.74, 2.91)* | 27.8 (1,372) | 1.29 (1.16, 1.43)* |
| A/AS Level | 11.7 (170) | 1.82 (1.35, 2.44)* | 24.8 (372) | 1.15 (1.00, 1.33)* |
| Diploma | 9.0 (124) | 1.39 (1.07, 1.81)* | 21.4 (299) | 0.99 (0.86, 1.14) |
| Degree | 6.5 (185) | - | 21.6 (551) | - |
| *Lone parenthood* | | | | |
| Lone parents | 27.9 (537) | 2.20 (1.93, 2.50)* | 43.1 (926) | 1.58 (1.47, 1.70)* |
| Couple families | 12.7 (1,585) | - | 27.2 (3,509) | - |
| *IMD (quintiles)^* | | | | |
| Most deprived | 30.0 (887) | 6.41 (4.85, 8.46)* | 45.7 (1,435) | 2.34 (2.07, 2.65)* |
| 2 | 19.1 (358) | 4.07 (3.05, 5.44)* | 31.6 (669) | 1.62 (1.41, 1.85)* |
| 3 | 12.6 (183) | 2.70 (1.99, 3.67)* | 29.6 (476) | 1.52 (1.32, 1.74)* |
| 4 | 6.2 (71) | 1.33 (0.94, 1.90) | 22.2 (285) | 1.14 (0.97, 1.33) |
| Least deprived | 4.7 (51) | - | 19.5 (241) | - |
| *Tenure* | | | | |

| | | | | |
|---|---|---|---|---|
| Other | 13.7 (129) | 2.62 (2.03, 3.39)* | 45.9 (397) | 1.95 (1.76, 2.15)* |
| Privately rent | 30.0 (301) | 5.73 (4.86, 6.76)* | 37.2 (431) | 1.58 (1.41, 1.76)* |
| Socially rent | 35.7 (1,150) | 6.82 (5.64, 8.23)* | 38.7 (1,346) | 1.64 (1.51, 1.79)* |
| Own/mortgage | 5.2 (540) | - | 23.6 (2,256) | - |

*p<=0.05; ^ England only

**Unadjusted association between the home environment and injuries occurring in the home**

When exploring the different aspects of housing quality individually, only one aspect of housing quality was associated with injury (Table 5.6). Compared to children living in homes with 1-<2 rooms per capita, children living in homes with 2+ rooms were less likely to have been injured. All of the other adverse housing features demonstrated increased risks, although these were not statistically significant. Small proportions of households displayed adverse housing scores, with over 60% of households having only one or no negative/moderate housing features. Children living in households with adverse housing scores were more likely to have been injured in the home than those with no negative housing features, although the elevated risk was not statistically significant in households with four or more 'negative features'.

Exploring the association between individual pieces of equipment and injury indicated that not owning safety equipment was associated with a slightly lower risk of injury for all equipment types, particularly smoke alarms. However none of the risk ratios were statistically significant, despite there being sufficient numbers to detect an effect. When looking at the total number of pieces of equipment owned in each household (using the safety score), households with between one and three pieces of equipment were at a slight increased (but non-significant) risk of injury compared to those with all four. However children living in households which owned no safety equipment were less likely to have been injured than those with all four.

*Table 5.6: Unadjusted risk ratios (and 95% CIs) for being injured in the MCS, according to measures of housing quality and safety equipment use*

| Home environment | % (N) | % (N) injured | RR for injury |
|---|---|---|---|
| Housing quality | | | |
| *Rooms per capita^* | | | |
| <1 | 9.1 (1514) | 24.0 (336) | 1.08 (0.96, 1.22) |
| 1-<2 | 70.5 (9995) | 22.2 (2227) | - |
| 2+ | 20.5 (2903) | 20.3 (587) | 0.92 (0.84, 1.00)* |
| *Building type* | | | |
| House/bungalow | 86.9 (12,557) | 21.6 (2712) | - |
| Flat/bedsit/room/other | 13.2 (1802) | 24.3 (425) | 1.13 (0.99, 1.28) |
| *Storey of main living space* | | | |
| Ground floor | 90.8 (13099) | 21.9 (2852) | - |
| Basement | 0.4 (47) | 21.8 (11) | 0.99 (0.59, 1.68) |
| First-second floor | 7.2 (963) | 22.6 (213) | 1.03 (0.89, 1.20) |
| Third floor and higher | 1.7 (269) | 25.8 (66) | 1.18 (0.97, 1.44) |
| *Access to garden* | | | |
| Yes, sole | 86.4 (12478) | 21.7 (2703) | - |
| Yes, shared | 3.6 (515) | 22.9 (116) | 1.06 (0.86, 1.29) |
| No | 10.0 (1420) | 24.0 (331) | 1.10 (0.97, 1.25) |
| *Heating- central heating* | | | |
| Yes | 90.6 (13052) | 21.8 (2838) | - |
| No | 9.4 (1359) | 23.5 (312) | 1.08 (0.96, 1.20) |
| *Damp or condensation* | | | |
| No | 86.4 (12491) | 21.8 (2692) | - |
| *Yes* | 13.7 (1911) | 23.2 (453) | 1.06 (0.96, 1.19) |
| *Housing score* | | | |
| 0 (no negative features) | 16.5 (2,308) ) | 20.1 (456) | - |
| 1 (1 negative feature) | 48.6 (6,911) | 21.3 (1,481) | 1.06 (0.95, 1.17) |
| 2-3 | 20.0 (3,023) | 23.8 (716) | 1.18 (1.05, 1.33)* |
| 4-5 | 9.1 (1,318) | 23.8 (293) | 1.19 (1.02, 1.37)* |
| 6+ | 5.9 (804) | 24.2 (191) | 1.20 (0.99, 1.47) |
| Safety equipment use | | | |
| *Fireguard* | | | |
| Yes | 31.1 (4548) | 22.1 (1030) | - |
| No | 68.9 (9862) | 21.9 (2120) | 0.99 (0.92, 1.07) |
| *Safety gate* | | | |
| Yes | 55.9 (7709) | 22.4 (1743) | - |
| No | 44.1 (6701) | 21.5 (1407) | 0.96 (0.89, 1.03) |
| *Electric socket covers* | | | |
| Yes | 54.2 (7415) | 22.3 (1647) | - |
| No | 45.8 (6995) | 21.6 (1503) | 0.97 (0.90, 1.04) |
| *Smoke alarm* | | | |
| Yes | 82.2 (11884) | 23.3 (2626) | - |
| No | 17.9 (2526) | 20.4 (524) | 0.92 (0.83, 1.01) |
| *Safety equipment (score)* | | | |
| All four (0) | 15.9 (2,189) | 21.3 (493) | - |
| Three (1) | 28.1 (3,876) | 22.8 (868) | 1.07 (0.94, 1.21) |
| Two (2) | 26.6 (3,910) | 22.9 (871) | 1.07 (0.96, 1.21) |
| One (3) | 22.5 (3,352) | 21.8 (728) | 1.02 (0.90, 1.17) |
| No equipment (4) | 7.0 (1,083) | 17.4 (190) | 0.81 (0.68, 0.97)* |

*P<=0.05

^number of rooms excluding bathrooms, toilets, halls and garages

**Inequalities in injury**

As shown in Table 5.7 (column B) and earlier in this Chapter (in Table 5.1), children from lower SECs were significantly more likely to be injured in the home than children from the most advantaged backgrounds, according to NS-SEC, maternal education, lone parenthood and area deprivation. As shown in Table 5.7, those living in socially rented homes (RR=1.35 [1.24, 1.46]) and those who were privately renting (RR=1.15 [1.00, 1.31]) were also more likely to be injured at home than children whose parents owned their home (outright or mortgaged).

**Home environment as a mediator**

The associations between SECs and injuries changed very little when controlling for the housing score (Table 5.7, Column C), with the exception of the increased risk seen in children living in privately rented households and those living in second most deprived quintile, which fell slightly and became non-significant. Controlling for the safety equipment score also had a minimal impact (Column D). Controlling for confounders (Column E) reduced the size of many of the RRs and in some cases they were no longer statistically significant. Closer inspection of the confounding variables revealed that this was largely due to children of younger mothers being more likely to have been injured and also to come from less advantaged backgrounds (data not shown).

*Table 5.7: Risk ratios (and 95% CIs) for being injured in the MCS, according to SECs, unadjusted and adjusted for aspects of the home environment*

| | %(N) | Unadj RR | Adj RR[1] | Adj RR[2] | Adj RR[3] |
|---|---|---|---|---|---|
| | *Col A* | *Col B* | *Col C* | *Col D* | *Col E* |
| *NS-SEC* | | | | | |
| Managerial | 19.0 (783) | - | - | | |
| Intermediate | 20.0 (597) | 1.05 (0.94, 1.17) | 1.05 (0.94, 1.17) | 1.05 (0.94, 1.17) | 1.02 (0.91, 1.14) |
| Routine | 25.4 (1479) | 1.33 (1.21, 1.47)* | 1.31 (1.19, 1.45)* | 1.32 (1.20, 1.46)* | 1.13 (1.01, 1.27)* |
| *Education* | | | | | |
| Degree | 16.9 (429) | - | - | | |
| Diploma | 21.0 (275) | 1.24 (1.07, 1.43)* | 1.24 (1.07, 1.43)* | 1.23 (1.07, 1.43) * | 1.20 (1.03, 1.39)* |
| A/AS Level | 19.9 (275) | 1.17 (1.02, 1.35)* | 1.17 (1.01, 1.34)* | 1.17 (1.01, 1.34)* | 1.07 (0.92, 1.25) |
| GCSE A-C | 23.8 (1163) | 1.40 (1.25, 1.58)* | 1.39 (1.23, 1.56)* | 1.39 (1.24, 1.57)* | 1.25 (1.10, 1.42)* |
| GCSE D-G | 24.1 (362) | 1.42 (1.24, 1.62)* | 1.40 (1.22, 1.60)* | 1.41 (1.23, 1.62)* | 1.18 (1.01, 1.37)* |
| No qualifications | 24.1 (569) | 1.42 (1.24, 1.63)* | 1.37 (1.20, 1.58)* | 1.42 (1.24, 1.63)* | 1.20 (1.02, 1.40)* |
| *Lone parenthood* | | | | | |
| Couple families | 21.2 (2592) | - | | | |
| Lone parents | 26.2 (559) | 1.23 (1.12, 1.36)* | 1.20 (1.09, 1.33)* | 1.22 (1.11, 1.35)* | 1.10 (0.99, 1.22) |
| *IMD (quintiles)*^ | | | | | |
| Least deprived | 19.7 (243) | - | - | - | - |
| 4 | 20.0 (261) | 1.02 (0.87, 1.19) | 1.00 (0.86, 1.18) | 1.01 (0.86, 1.18) | 1.02 (0.87, 1.20) |
| 3 | 22.5 (349) | 1.14 (0.98, 1.32) | 1.12 (0.96, 1.30) | 1.13 (0.97, 1.32) | 1.09 (0.93, 1.28) |
| 2 | 22.9 (432) | 1.16 (1.01, 1.34)* | 1.13 (0.98, 1.31) | 1.15 (0.99, 1.33) | 1.07 (0.92, 1.26) |
| Most deprived | 23.7 (649) | 1.20 (1.05, 1.37)* | 1.15 (1.00, 1.33)* | 1.20 (1.04, 1.39)* | 1.09 (0.93, 1.28) |
| *Tenure* | | | | | |
| Own/mortgage | 19.9 (1789) | - | - | - | - |
| Socially rent | 26.8 (915) | 1.35 (1.24, 1.46)* | 1.34 (1.23, 1.45)* | 1.36 (1.25, 1.47)* | 1.14 (1.04, 1.25)* |
| Privately rent | 22.8 (254) | 1.15 (1.00, 1.31)* | 1.14 (0.99, 1.31) | 1.16 (1.01, 1.33)* | 1.03 (0.89, 1.19) |
| Other | 23.3(192) | 1.17 (1.01, 1.35)* | 1.17 (1.01, 1.35)* | 1.21 (1.05, 1.39)* | 1.12 (0.95, 1.31) |

*P<=0.05. ^ England only. [1] Adjusting for housing score; [2] Adjusting for housing score and safety equipment score; [3] Adjusting for confounders: number of children in family, maternal age at first live birth, ethnicity and main childcare between 9 months and 3 years.

### *5.4.4 Sensitivity analyses*

A number of sensitivity analyses were conducted to address some of the limitations in the data. These are now described.

**Relevance of safety equipment to certain households and injuries**

As stated earlier, a score for safety equipment use was explored as a proxy for safety in the home environment. However some equipment types were only relevant to particular households. For example some households may not have a fire and so would therefore not require a fireguard. It is also possible that the type of injury that had occurred would not have been preventable by a given piece of equipment, for example it is implausible that electric socket covers could have prevented poisonings. Two sensitivity analyses

were conducted to explore the potential impact of these limitations (see Appendix 5). Firstly the risk of burns and scalds, which were recorded in the same category in the MCS, was investigated in relation to fireguard use and limited to households that owned a working fire. The risk ratio for being burned or scalded was 1.05 (0.85, 1.05) in children who lived in households with a fire but without a fireguard, compared to those had a fire guard. The association between safety gate use and injuries that may have occurred due to a fall (head injuries, broken bones and fractures) was explored, since these types of injury are the most likely to be prevented by safety gates. The risk of injury was not affected however, with a RR of 0.95 (0.85, 1.05) for children who lived in households which did not use a safety gate compared to those which did (Appendix 5, Table 5A2).

**Classification of injuries occurring in the home**

23% of children who had experienced their most severe injury outside the home had been injured more than once. These children were included in the baseline along with children who had not been injured at all; however they may have experienced a less severe injury in the home. The analyses were therefore repeated excluding children who had been injured outside the home (so comparing those who had been injured in the home to those who had not been injured at all), and the associations were little changed (Appendix 5, Table 5A3).

**Changes in the home environment**

Aspects of the home environment were captured at age 9 months (first sweep) and were explored in relation to injuries occurring between 9 months and 3 years (reported at the second sweep), in order to avoid reverse causality. However 32% of families had moved residence between the first and second sweep and may have spent limited periods of time in the environments reported at the first sweep. A sensitivity analysis was therefore conducted, exploring the association between the SECs and injury (unadjusted and adjusting for the home environment) only in families who had not moved. The associations remained largely unchanged when compared to those in all households (Appendix 5, Table 5A3).

**Exploring individual components of housing quality and safety equipment rather than scores**

When exploring the home environment as a potential mediator between SECs and injuries, the housing and safety equipment scores have been used. Table 5A4 in Appendix 5 shows the RRs for being injured according to SECs before and after controlling for the individual components of housing quality and safety equipment use. Despite the inevitable reduction in statistical power, patterns were largely unchanged.

**Correlation between the housing and safety equipment scores**

The housing and safety equipment scores were intended to act as proxies for the home environment. However it is possible that they are representing the same thing. Therefore the association between the two scores was explored to see how highly correlated they were (Appendix 5, Table 5A5). Whilst the linear association between the scores was significant ($p<0.001$), the R-squared was 0.04 indicating that only a small amount (4%) of the variation in the housing score is explained by the safety equipment score.

## 5.5 Discussion

### *5.5.1 Summary of findings*

Children from less advantaged backgrounds were more likely to have been injured in the home between the age of 9 months and 3 years and were also more likely to live in households with more negative housing features and fewer pieces of safety equipment. However the elevated risks of injury observed in children from less advantaged SECs were largely unaffected when controlling for the housing quality and safety equipment scores. This implies that the measures of housing quality explored in this analysis do not mediate the association between SECs and childhood injury, and that the use of safety gates, fire guards, electric socket covers and smoke alarms does not affect inequalities in injury overall at a population level.

### *5.5.2 Strengths and Limitations*

This chapter has explored whether the home environment mediates the association between SECs and childhood injury in the home in a large and contemporary UK cohort. Overarching strengths and limitations concerning the MCS are discussed in Chapter 3 (3.2.5). The large sample size and wide range of information collected allowed several measures of SECs and various aspects of the home environment to be investigated. The longitudinal design also allowed the investigation of injuries occurring

between the age of 9 months and 3 years in relation to the home environment and SECs measured at 9 months. However it was not possible to establish a temporal relationship between SECs and the home environment because they were measured at the same point in time (at age 9 months). Because place of injury was not recorded at the first sweep it was not possible to look at the difference in injuries occurring in the home, although there was no significant difference in the risk of injury (occurring anywhere) between children who did not respond to the second sweep and those who did. However those who were not included in the second sweep were more likely to live in lesser quality household environments, although the response weights will have taken this into account to some degree.

Injury was based upon maternal report and this is discussed in more depth in Chapter 3 (3.2.5). Studies have shown a reasonable to high level of agreement between maternal recall of injury and medical records, although accuracy declines as the period of recall increases[121;123], particularly if it exceeds two years[121]. The analyses in this chapter used data which was collected when the child was 3 years and referred to injuries which may have occurred anytime since the age of 9 months. The maximum period of recall would therefore be approximately 2.5 years, although in many cases would be less than this.

Location of the injury was only reported for the most severe (or only) injury. Approximately 3% of children had been injured twice or more and had experienced their most severe injury outside the home. These children were included in the baseline (as having not been injured in the home), although it was possible that some had also been injured at home. However a sensitivity analysis, which explored the association excluding these children (Appendix 5), found that the associations were similar to those reported here. In order to account for the fact that some families had changed residence between the first and second sweeps and that had therefore possibly spent limited amounts of time in the first residence (for which housing quality and safety equipment were reported) may have been limited, the analysis was repeated only in children who had not moved since the last sweep.

Objective measures of housing features were used and therefore any response bias (according to socio-economic background or injury) should be limited. However these measures can only be considered a proxy for housing quality or safety. Other aspects of the home environment which might also contribute to inequalities in injury include

levels of disrepair (for example unsecure cupboard doors leaving cleaning fluids accessible, or loose floor boards causing falls), room size (which might influence how clear a room is for a child to play or the ability for parents to safely store potentially hazardous items), and specific hazards such as unsafe electrical equipment (which could cause electrocutions), and it was not possible to explore these. However one might argue that households which have fewer rooms per capita or no access to a garden, or that are situated on higher storeys may pose a greater injury risk for children than homes with outdoor space and more room inside. High rise flats are more likely to have balconies, communal stairs and unsecured windows[171] than homes which are based on the ground floor. Households which do not have central heating or that have damp may be in a greater state of disrepair or be more likely to have unsafe electrical equipment than households which have central heating and no damp. However the pathways through which these features might influence injury are not clear and their use as proxy measures is emphasised.

Housing and safety equipment scores were used in this chapter because the measures collected in the MCS can only be considered proxies for the areas they were being used to represent (housing and safety equipment use). Arbitrary values (of 0, 1, 2) were assigned to each of the housing features to create the housing score, thus giving equal weighting to each aspect of housing regardless of whether they were genuinely comparable. There is a lack of research exploring these individual aspects of housing in relation to injury risk, although future research might be used to compile a more sensitive scoring system using more advanced statistical techniques. The analyses were repeated using the individual variables rather than scores and the results were not altered. There was limited variation in the housing quality measures, for example more than 60% of households had either only one or no adverse housing features. This limited variability in the sample may explain why housing had a limited impact on the social distribution of injury. However if this is the case (and assuming the MCS is representative of the general population) then the implication would be that changes to the home environment are unlikely to have a significant impact on injury rates at the population level, because there is little room left for improvement.

Studies investigating the validity of parental report of home safety practices have found it to be generally reliable[172-175], particularly if interviews were carried out in the home[172], or if exploring relative differences between groups rather than identifying

individual need or risk[174]. However using MCS data it was not always possible to ascertain whether certain pieces of equipment were relevant or necessary to the home and this may have diluted any effects. For example, safety gates might be considered more applicable to homes with stairs, and we were unable to distinguish between homes with and without internal stairs. Furthermore, all types of injuries were explored together (in order to maximise power) and only certain types of injury can be prevented by different pieces of safety equipment. Two sensitivity analyses were conducted to explore the potential impact on the results; the first exploring fire guards in relation to burns and scalds in children living in homes with fires, and the second safety gates in relation to falls and head injuries. Both of these sensitivity analyses implied that the lack of an association between safety equipment use and injury risk was not due to these limitations. The lack of specificity even in these sensitivity analyses might still explain the lack of an association (for example burns in children are commonly caused by exposure to hot water or hair straighteners, which cannot be prevented with fire guards). It is also possible that the proxy measures of the home environment did not alter the social gradient in injuries because they are measuring or capturing the same thing as the SECs measures (multi-collinearity).

The MCS is a large dataset and therefore the lack of an association is unlikely to be explained by insufficient statistical power to detect an effect. If there is truly no association between safety equipment use and injury, a possible explanation might be "risk compensation", which has been demonstrated in both children[176] and parents[177]. Children living in households with no safety equipment were less likely to be injured. Households which owned no safety equipment (and particularly smoke alarms) are likely to be very different from those with all four pieces of equipment that were recorded in the MCS. However a number of potential factors were explored which might explain this association (all of the SECs measures, the confounders explored in the main analysis and the housing score) and none seemed to attenuate the association. Therefore there is a strong possibility that the patterns observed are due to residual confounding. Finally, a simple method for analysis was used, rather than structural equation modeling[178], or techniques that can be used to formally test for mediation[179].

### *5.5.3 Comparison with other findings*

A study of injury rates in adults living in Wales found that build type was related to injury rates, with flats and terraces being at higher risk and detached houses being at

lower risk (compared to semi-detached)[180]. Findings from Avon Longitudinal Study of Parents and Children (ALSPAC)[23] indicated that preschool children who lived in a flat or bedsit, who did not have access to a garden, who had moved since the last sweep, or who lived in houses with a higher number of adults were at an increased risk of injury before adjustment for SECs and other child and mother characteristics. Findings from this chapter also demonstrate that children who were living in households with negative housing features were at an increased risk of injury in the univariate analyses.

A recent review of trials and before-and-after studies assessed the impact of safety equipment distribution and accompanying educational programmes and risk assessments on childhood injury[84]. The authors found that there is only weak evidence to suggest a positive impact of these interventions on childhood injury, and this is in agreement with findings from an earlier systematic review[72]. The MCS analysis reported in this chapter was also unable to detect an effect. However findings from other observational studies in preschool children are mixed; one study set in Avon, England reported no affect after controlling for other risk factors[23] whilst two others in Nottingham and Scotland demonstrated a beneficial impact of safety equipment use[24;181].

The social gradients in childhood injuries demonstrated here have been cited in many other studies and it has been hypothesised that the home environment may explain these inequalities [77;109]. However this is the first individual level study, to my knowledge, to have investigated whether the home environment mediates the association between socio-economic background and injuries occurring to pre-school children in the home. Whilst two studies exploring predictors of preschool injuries investigated measures of socio-economic background and the home environment [23;24], neither specifically sought to investigate the home environment as a mediator between SECs and injury. Due to this fact, and because the models also controlled for other factors such as child development and maternal psychosocial factors, it is not possible to make inferences based on these studies.

### *5.5.4 Implications for further research, policy and practice*

Children from less advantaged backgrounds may be exposed to more hazardous home environments, due to overcrowding or unsafe structures, and parents may not be able to afford safety equipment. Improving the quality of the home environment has been an

important plank in the UK government's strategy to reduce inequalities in health and welfare, including childhood injury[4]. This has included steps to improve the quality of social housing[4], and a home safety equipment scheme which has provided free or low cost safety equipment and safety consultations to low income families[118]. Findings from this chapter imply that the use of certain pieces of safety equipment does not significantly decrease the risk of household injuries in young children, or their social gradient, at a population level. However this is not to say that, at the individual level, specific pieces of safety equipment (if used correctly) will not have benefits for certain types of injury in certain households.

Findings presented in this chapter also indicate that steps to improve housing quality, in isolation, are unlikely to reduce inequalities in childhood injuries. A good quality home environment is undoubtedly helpful for the prevention of injuries occurring in the home. However, in this study it does not appear to be sufficient to reduce inequalities in injuries at the population level (possibly due to the small proportions of households which demonstrate lesser quality housing as measured in the MCS). Nevertheless, there are many other potential gains from further improvements to housing quality, for other aspects of health (for example asthma, fever and mental health) and health inequalities[165;182], educational attainment, and crime reduction[183], which could benefit young children and all other household members.

Evidence related to causal mechanisms between socio-economic status and childhood injuries is 'patchy and imbalanced'[22]. Findings in this chapter suggest that the home environment may not, in this context, lie on the causal pathway. This may be because of the relatively high standard of housing experienced by the MCS children; if this association was to be explored in more deprived populations, for example in less developed countries, then the results might be different. There is research to suggest that parental factors such as supervision[184], risk taking behaviours[185;186], ability to match children's capabilities to tasks, wanting to foster independence in their children, ability to recognise hazards[76], maternal depression and social support[187] are associated with childhood injuries. Many of these factors may be socially distributed, although there appears to be limited amount of research in these areas. A recent systematic review of qualitative research exploring barriers and facilitators for the prevention of unintentional injuries, largely from the US and Australia, highlighted low levels of parental education, coupled with a lack of awareness of risk, as risk factors for injury[188]. A community-

based study carried out in Scotland in the mid nineties found that safety attitudes, knowledge and practices in parents of preschool children did not vary between deprived and advantaged areas; on this basis the authors concluded that attitudes are unlikely to explain inequalities in injury[189]. It is also possible that maternal psychosocial factors could mediate the association between socio-economic and injuries, for example social support or control over the home environment.

This is the first study, to my knowledge, to explore the impact of the home environment on inequalities in childhood injuries which occur in the home. Both its findings and the study limitations suggest that further research into this area is required, including the potential contribution of parental factors to inequalities in injury. There is a dearth of research exploring other possible contributors to inequalities, such as supervision or social support, and this could help establish why these inequalities exist and contribute to the design or adaptation of policies to reduce them.

## 5.6 Summary of findings

- Data from the EHCS and the GHS indicate that some aspects of the home environment have improved over the past decade (e.g. increased ownership of smoke alarm and central heating), whilst the proportion of households with preschool children living in flats or with low numbers of rooms per capita has increased.
- In the MCS injuries occurring in the home between 9 months and 3 years are socially distributed, with children from less advantaged backgrounds displaying a higher risk of injury.
- A low proportion of infants lived in poor quality home environments at age 9 months, although those from less advantaged backgrounds were consistently more likely to live in these households.
- Using a housing quality score, more adverse housing (at 9 months) was associated with an increased risk of injury (between the age of 9 months and 3 years).
- However children living in households with no safety equipment were less likely to be injured than those with all four pieces of equipment (safety gate, fireguard, electric socket covers and smoke alarm).

- The elevated risk of being injured in the home observed in children from less advantaged backgrounds was unaffected when controlling for aspects of the home environment. This implies that these aspects of the home environment do not lie on the causal pathway between SECs and injury.
- This is the first individual study, to my knowledge, to explore the home environment as a mediator between SECs and injuries occurring in the home. The study has a number of limitations and findings must be interpreted with caution, however results imply that changes to the home environment and campaigns to increase safety equipment use will not influence inequalities in injury.
- In Chapter 6 the second link the injury case study will be explored: childcare and unintentional injury.

# 6 Chapter 6 – Childcare use and inequalities in unintentional injury

In Chapter 2 the association between childcare and unintentional injuries was selected as one of the links to be explored in Phase 2 for the injury case study. In chapters 3 and 4 trends and inequalities in unintentional injury and childcare were described. This chapter investigates the association between childcare use and inequalities in injury. This analysis also provides the overlap between the two case studies.

Some of the results from this chapter have been published previously in the following paper: Pearce et al. Does childcare influence socioeconomic inequalities in unintentional injury? Findings from the UK Millennium Cohort Study". Journal of Epidemiology and Community Health. 2009. 26;2:161-166 (Appendix 1).

## 6.1 Objectives

- To explore the association between childcare use and unintentional injury between birth and 9 months, and between 9 months and 3 years, and whether it differed by socio-economic circumstances (SECs), using data from the Millennium Cohort Study (MCS).

## Exploring the association between childcare and inequalities in injury

## 6.2 Background

As discussed in Chapter 3, childcare is now an integral part of many families' lives and an assessment of formal childcare in OECD countries highlighted the potential for childcare to become a "new and potent source of inequality", if children from more advantaged families benefit from high quality childcare whilst those from disadvantaged backgrounds are at risk of harm from lower quality childcare[145] (page 32). Under the UK government childcare strategy, free early years education places are available to all children aged three-four years for 12.5 hours a week and has recently been extended to 15 hours a week[17]. Two-year olds living in the most deprived areas in England have also been eligible for this entitlement since 2009[142]. Reviews have noted that formal childcare can have a beneficial effect on children's learning and development as well as on long term outcomes such as crime and teenage pregnancy rates (see Chapter 3). Less

is known about the impact childcare may have on physical health, including unintentional injury and especially in different socio-economic groups.

A small number of studies have explored the impact of childcare upon unintentional injury in children, all of which have been based outside the UK. In general these indicated that the risk of unintentional injury was lower in childcare than when at home [190-193]. However these were all conducted outside the UK and the majority only explored formal childcare[190-192]. Despite unintentional injury being one of the most socially patterned causes of disability and ill health in children, no studies have explored whether childcare has a differential impact on injury according to socio-economic background, although it has been postulated that an increase in childcare use might broaden inequalities in health and wellbeing as children from higher income groups benefit from more expensive and higher quality childcare[86]. In contrast it has been speculated that childcare could provide safe environments for children from less advantaged backgrounds who are exposed to less safe home environments[77].

This chapter explores the association between childcare and unintentional injuries in infants between birth and 9 months, and in young children between 9 months and 3 years, overall and in different socio-economic groups. Childcare might not only reduce the overall risk of injury through providing safer environments when in childcare, but also through the promotion of safety awareness in mothers of young children, or the children themselves. In the MCS it was not possible to determine whether the injuries occurred when in childcare or when being cared for only by a parent, and therefore this analysis explores the combined impact that childcare may have on unintentional injuries, as with the study conducted by Schwebel and colleagues[193]. However this chapter adds to the evidence base by exploring the association in a cohort of UK children and differentiating between informal and formal childcare types.

## 6.3 Methods

### *6.3.1 Participants*

The analyses in this chapter include 18,114 infants for whom information on both childcare and injuries were available at age 9 months (99%), and 13,718 children with data at 3 years (95%). As stated in Chapter 3, there was no significant difference in injury rates at age 9 months between children who did not respond to the second sweep and those who did. Infants who did not take part in the second sweep were more likely

to be cared for only by a parent and less likely to be cared for in formal childcare (Chapter 4).

### *6.3.2 Measures*

**Explanatory measures: Childcare**

As outlined in Chapter 2 and Appendix 2, children were classified according to the first reported non-parental care that they were exposed to over the period in question; using the categories informal and formal childcare and parent only. Where one non-parental childcare type had stopped and been replaced by another, the childcare which the child had been in for the longest duration was used (this applies only to the second sweep data since questions about new or replacement childcare arrangements were not asked at the first sweep).

**Outcome measures: Injury**

Infants were classified as having been injured if their mother reported them having visited a doctor, health centre or hospital as the result of an injury one or more times between birth and 9 months, and between 9 months and 3 years of age. Although location of the most (or only) severe injury was reported at the second sweep (see Chapter 5), it was not always possible to determine whose care the child was in when the injury occurred.

**Socio-economic circumstances**

The four measures of socio-economic circumstances (SECs) outlined in Chapter 2 were used for this analysis: NS-SEC, maternal education, lone parenthood and area deprivation. For the second sweep analyses NS-SEC and maternal education measures collected at 9 months were used, since these were unlikely to have changed. Lone parenthood and area deprivation measures captured at the second sweep were used.

**Confounders**

As with all other analyses, maternal age at first live birth, the mother's ethnicity, and the number of children living in the household were adjusted for as potential confounders. Age at time of survey was also adjusted for since it was related to injury risk: the youngest (aged 8 months) and oldest (age 12 months) infants were the most likely to have been injured since birth at age 9 months, whereas between 9 months and 3 years the risk of injury increased slightly with age; and also childcare: between birth and 9

months childcare use varied significantly by age although with no discernable pattern; between 9 months and 3 years older children were less likely to be looked after only by a parent and more likely to be looked after in formal childcare when compared to younger children (see Appendix 2.5). The housing and safety scores used in Chapter 4 were also explored as potential confounders but were not found to alter the association and so were not adjusted for.

### *6.3.3 Analysis*

As outlined in Chapter 2, two approaches to exploring the impact of policies on inequalities in health are used in this thesis. In this chapter the second method is used, which explores whether the impact of a policy varies for different social groups, because it is possible that the quality of childcare received varies by SECs. Firstly the overall association between childcare and unintentional injury is explored using Poisson regression, then it is stratified by each of the SECs measures in order to observe whether the association varies by social background.

The following analyses were conducted for both time periods (birth to 9 months, 9 months to 3 years). Firstly the percentage uptake of childcare (parent, informal, formal) and also the percentage of children who had visited a medical professional due to an injury were estimated. Poisson regression was then used to estimate unadjusted risk ratios (RR) for being injured according to whether children were regularly cared for in informal or formal childcare, compared to those who were cared for only by a parent. Following this risk ratios adjusted for potential confounding factors (aRR) were estimated. The unadjusted and adjusted analyses were repeated then for each stratum of the SECs measures. A number of sensitivity analyses were also conducted to address some of the limitations in the data.

## 6.4 Results

As demonstrated in Chapter 4, between birth and 9 months half (50%) of infants were cared for only by a parent; for the period 9 months to 3 years this had fallen to 41%. 35% were cared for in informal childcare between birth and 9 months and this declined slightly between 9 months and three years (31%). Formal childcare use increased between the two periods, from 16% to 28%. Between birth and age 9 months 8.1% of infants, and between 9 months and 3 years just over one third, had been taken to a doctor, health centre or hospital for an injury.

Table 6.1 provides the proportion of children injured between birth and 9 months (column A) and between 9 months and 3 years (column D) according to informal and formal childcare (baseline parental care only). Unadjusted and adjusted RRs for reported injury according to childcare type, used between birth and 9 months (columns B and C), and between 9 months and 3 years (columns E and F), overall and stratified by social group.

### *6.4.1 Association between childcare and injury from birth to 9 months*

In the overall analysis, childcare use was not associated with the risk of injury (occurring anywhere) in the unadjusted or adjusted analysis (Table 6.1, columns B and C). However, when stratifying by SECs some interesting patterns emerged. Firstly considering strata by NS-SEC, of infants whose mothers were from the managerial & professional group, those who were cared for in formal childcare were significantly less likely to be injured compared to those who were cared for only by a parent, and this association strengthened after controlling for confounders (aRR=0.66 [0.50, 0.89]). In intermediate groups, infants cared for in informal childcare had a lower risk of injury after controlling for confounders with an aRR of 0.69 (0.51, 0.92), compared to those looked after only by a parent. In contrast infants from the routine & manual group who were cared for in formal childcare were more likely to be injured than those being cared for only by a parent (aRR=1.46 [1.01, 2.12]).

Similarly, when considering strata by maternal education, infants whose mothers had a degree or A Levels and were cared for in formal childcare were significantly less likely to be injured compared to those who were only looked after by a parent. Those whose mothers highest educational qualifications were GCSE grades D-G were more than twice as likely to be injured if they were cared for in formal childcare (compared to those looked after only by a parent). Infants whose mothers had A Levels were also less likely to be injured if they were looked after in informal childcare compared to those looked after only by a parent (aRR=0.66 [0.48, 0.92]). There were no associations in the analyses stratified by lone parenthood status. Infants living in the most deprived fifth of areas in England were more likely to be injured if they were cared for in informal childcare in the unadjusted analysis, compared to care only by a parent, although the association was no longer significant after controlling for confounders.

*Table 6.1: Association between main childcare type and reported injury between birth and age 9 months and between 9 months and 3 years in the MCS: unadjusted and adjusted risk ratios (RR (95% CIs0), overall and stratified by SECs*

| Childcare | ***Birth-9 months*** **% (N) injured** *Col A* | **Unadjusted RR** *Col B* | **Adjusted RR**** *Col C* | ***9 months- 3 years*** **% (N) injured** *Col D* | **Unadjusted RR** *Col E* | **Adjusted RR**** *Col F* |
|---|---|---|---|---|---|---|
| **Overall association** | | | | | | |
| Parent only | 8.2 (709) | - | - | 34.8 (1953) | - | - |
| Informal | 8.4 (542) | 1.03 (0.91, 1.17) | 0.92 (0.81, 1.05) | 37.4 (1651) | 1.07 (1.00, 1.15)* | 1.05 (0.98, 1.13) |
| Formal | 7.5 (188) | 0.92 (0.77, 1.11) | 0.88 (0.73, 1.07) | 35.0 (1268) | 1.00 (0.93, 1.08) | 1.02 (0.95, 1.10) |
| Stratified associations | | | | | | |
| **NS-SEC** | | | | | | |
| *Routine & Manual* | | | | | | |
| Parent only | 8.4 (375) | - | - | 37.1 (1073) | - | - |
| Informal | 9.6 (273) | 1.15 (0.95, 1.38) | 1.04 (0.86, 1.26) | 41.4 (727) | 1.12 (1.02, 1.22)* | 1.09 (1.00, 1.20)* |
| Formal | 12.5 (31) | 1.50 (1.03, 2.17)* | 1.46 (1.01, 2.12)* | 40.6 (362) | 1.09 (0.98, 1.23) | 1.09 (0.97, 1.22) |
| *Intermediate* | | | | | | |
| Parent only | 8.7 (132) | - | - | 34.6 (320) | - | - |
| Informal | 6.6 (106) | 0.76 (0.57, 1.02) | 0.69 (0.51, 0.92)* | 35.6 (409) | 1.03 (0.90, 1.17) | 1.03 (0.90, 1.17) |
| Formal | 8.2 (41) | 0.95 (0.64, 1.40) | 0.86 (0.58, 1.26) | 35.0 (267) | 1.01 (0.85, 1.20) | 1.01 (0.85, 1.20) |
| *Managerial & Professional* | | | | | | |
| Parent only | 9.0 (136) | - | - | 33.2 (287) | - | - |
| Informal | 8.1 (123) | 0.89 (0.69, 1.16) | 0.81 (0.63, 1.04) | 33.8 (442) | 1.02 (0.87, 1.19) | 0.98 (0.85, 1.14) |
| Formal | 6.6 (111) | 0.73 (0.55, 0.97)* | 0.66 (0.50, 0.89)* | 33.1 (571) | 1.00 (0.88, 1.13) | 0.98 (0.87, 1.10) |
| **Education** | | | | | | |
| *No qualifications* | | | | | | |
| Parent only | 5.6 (136) | - | - | 34.6 (516) | - | - |
| Informal | 7.6 (84) | 1.36 (1.00, 1.84) | 1.30 (0.97, 1.75) | 35.0 (180) | 1.01 (0.86, 1.19) | 0.91 (0.77, 1.08) |
| Formal | 6.8 (3) | 1.21 (0.43, 3.42) | 1.09 (0.38, 3.16) | 37.5 (114) | 1.08 (0.88, 1.33) | 1.03 (0.84, 1.28) |
| *GCSE D-G* | | | | | | |
| Parent only | 9.0 (92) | - | - | 37.5 (278) | - | - |
| Informal | 9.9 (69) | 1.09 (0.77, 1.56) | 0.96 (0.67, 1.38) | 36.7 (165) | 0.98 (0.81, 1.19) | 0.99 (0.82, 1.20) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Formal | 18.7 (16) | 2.07 (1.22, 3.49)* | 2.09 (1.22, 3.56)* | 41.1 (103) | 1.10 (0.91, 1.34) | 1.09 (0.90, 1.33) |
| *GCSE A-C* | | | | | | |
| Parent only | 8.3 (253) | - | - | 36.0 (690) | - | - |
| Informal | 7.8 (196) | 0.95 (0.76, 1.18) | 0.86 (0.69, 1.07) | 40.4 (702) | 1.12 (1.00, 1.26)* | 1.11 (0.98, 1.24) |
| Formal | 8.5 (45) | 1.03 (0.72, 1.46) | 0.99 (0.70, 1.41) | 38.4 (390) | 1.07 (0.93, 1.22) | 1.06 (0.93, 1.22) |
| *A Level* | | | | | | |
| Parent only | 11.8 (79) | - | - | 36.9 (146) | - | - |
| Informal | 8.6 (62) | 0.73 (0.52, 1.03) | 0.66 (0.48, 0.92)* | 35.0 (177) | 0.95 (0.77, 1.16) | 0.93 (0.75, 1.14) |
| Formal | 5.6 (19) | 0.47 (0.28, 0.81)* | 0.47 (0.27, 0.82)* | 31.0 (135) | 0.84 (0.66, 1.07) | 0.84 (0.66, 1.07) |
| *Diploma* | | | | | | |
| Parent only | 8.6 (53) | - | - | 32.4 (112) | - | - |
| Informal | 7.4 (50) | 0.86 (0.57, 1.32) | 0.78 (0.51, 1.19) | 37.6 (194) | 1.16 (0.94, 1.44) | 1.16 (0.93, 1.44) |
| Formal | 6.9 (24) | 0.81 (0.48, 1.36) | 0.75 (0.45, 1.27) | 36.4 (148) | 1.12 (0.89, 1.42) | 1.17 (0.92, 1.50) |
| *Degree* | | | | | | |
| Parent only | 9.5 (81) | - | - | 29.8 (151) | - | |
| Informal | 10.6 (73) | 1.11 (0.81, 1.53) | 1.05 (0.77, 1.41) | 33.6 (211) | 1.13 (0.93, 1.36) | 1.08 (0.90, 1.31) |
| Formal | 6.8 (78) | 0.71 (0.50, 1.00)* | 0.64 (0.46, 0.91)* | 31.3 (356) | 1.05 (0.89, 1.24) | 1.02 (0.86, 1.21) |
| **Lone parenthood** | | | | | | |
| *Lone parent* | | | | | | |
| Parent only | 9.5 (179) | - | - | 40.3 (384) | - | - |
| Informal | 10.2 (102) | 1.07 (0.78, 1.47) | 1.02 (0.74, 1.39) | 40.9 (279) | 1.02 (0.88, 1.18) | 1.01 (0.88, 1.18) |
| Formal | 8.5 (15) | 0.89 (0.51, 1.54) | 1.01 (0.58, 1.79) | 40.9 (227) | 1.02 (0.88, 1.17) | 1.08 (0.94, 1.25) |
| *Couple family* | | | | | | |
| Parent only | 7.9 (530) | - | - | 33.7 (1569) | - | - |
| Informal | 8.1 (440) | 1.03 (0.90, 1.19) | 0.90 (0.78, 1.04) | 36.7 (1372) | 1.09 (1.01, 1.17)* | 1.06 (0.98, 1.14) |
| Formal | 7.4 (173) | 0.94 (0.77, 1.15) | 0.86 (0.70, 1.06) | 33.9 (1041) | 1.01 (0.93, 1.09) | 1.02 (0.93, 1.10) |
| **IMD (quintiles)^** | | | | | | |
| *Most deprived* | | | | | | |
| Parent only | 7.4 (159) | - | - | 34.1 (481) | - | - |
| Informal | 10.2 (114) | 1.38 (1.08, 1.77)* | 1.25 (0.97, 1.62) | 42.1 (238) | 1.23 (1.08, 1.41)* | 1.15 (1.00, 1.31)* |
| Formal | 10.3 (18) | 1.38 (0.81, 2.35) | 1.35 (0.82, 2.21) | 36.8 (170) | 1.08 (0.92, 1.26) | 1.05 (0.89, 1.23) |
| *$4^{th}$ quintile* | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Parent only | 8.9 (106) | - | - | 37.2 (250) | - | - |
| Informal | 10.4 (91) | 1.17 (0.88, 1.56) | 1.07 (0.80, 1.43) | 40.3 (246) | 1.08 (0.93, 1.26) | 1.09 (0.94, 1.27) |
| Formal | 9.1 (23) | 1.02 (0.65, 1.61) | 1.00 (0.62, 1.62) | 36.5 (151) | 0.98 (0.82, 1.17) | 1.05 (0.88, 1.26) |
| *3rd quintile* | | | | | | |
| Parent only | 7.4 (67) | - | - | 35.5 (210) | - | - |
| Informal | 7.6 (51) | 1.03 (0.71, 1.48) | 0.88 (0.60, 1.29) | 39.6 (202) | 1.12 (0.95, 1.31) | 1.09 (0.92, 1.28) |
| Formal | 5.5 (16) | 0.74 (0.43, 1.28) | 0.63 (0.35, 1.12)* | 36.2 (152) | 1.02 (0.85, 1.22) | 1.00 (0.84, 1.20) |
| *2nd quintile* | | | | | | |
| Parent only | 8.4 (55) | - | - | 32.4 (139) | - | - |
| Informal | 6.4 (32) | 0.76 (0.50, 1.18) | 0.67 (0.44, 1.03) | 34.8 (143) | 1.07 (0.88, 1.31) | 1.08 (0.88, 1.32) |
| Formal | 7.4 (26) | 0.89 (0.56, 1.41) | 0.82 (0.51, 1.31) | 34.1 (165) | 1.05 (0.87, 1.27) | 1.04 (0.86, 1.27) |
| *Least deprived* | | | | | | |
| Parent only | 8.6 (55) | - | - | 31.1 (133) | - | - |
| Informal | 8.6 (31) | 1.00 (0.66, 1.53) | 0.92 (0.61, 1.39) | 27.5 (95) | 0.88 (0.71, 1.11) | 0.87 (0.69, 1.09) |
| Formal | 6.8 (26) | 0.79 (0.50, 1.24) | 0.74 (0.47, 1.16) | 31.8 (186) | 1.02 (0.85, 1.23) | 1.04 (0.86, 1.26) |

*P=<0.05. ** Adjusted for maternal age, ethnicity, family size, age in months. ^ children living in England only.
Missing at 9 months: injury 22, childcare 123, NS-SEC 245, maternal education 66, area deprivation 2, maternal age 653, ethnicity 48. Missing at 3 years: injury 9, childcare 683, NS-SEC 176, maternal education 31, area deprivation 1, maternal age 428, ethnicity 31.

### *6.4.2 Association between childcare and injury between 9 months and 3 years*

Between the age of 9 months and 3 years there was a slightly elevated risk of injury (RR=1.07 [1.00, 1.15]) was experienced by children who were looked after in informal childcare in the unadjusted analysis (column E), compared to those looked after only by a parent. However this was no longer significant after controlling for confounders (column F).

In the stratified analyses, the elevated risk observed in informal childcare in the unadjusted analysis reappeared in certain strata. Children whose mothers were from routine & manual backgrounds (aRR=1.09 [1.00, 1.20]) and those living in the most deprived fifth of areas in England (aRR=1.15 [1.00, 1.31]) were more likely to have been injured since the age of 9 months if they were cared for in informal childcare, compared to those only cared for only by a parent. Children living in couple families and whose mothers had GCSE A-C who were cared for in informal childcare were also more likely to be injured compared to children cared for only by a parent, although these elevated risks were not significant after controlling for confounders.

### *6.4.3 Sensitivity analyses*

Two sensitivity analyses were conducted in order to address some of the limitations in the data. The first explored whether the associations between childcare and injury were altered when conducted only in children who were looked after in one type of non-parental care, and the second excluded nannies and au pairs from the formal childcare category. These are now briefly described (the data are provided in Appendix 6).

**Excluding children who were looked after in more than one type of childcare**

Children were classified according to the main non-parental childcare type used across the periods in question. Approximately one third of mothers using informal or formal childcare used at least one additional childcare arrangement (either with the main childcare type or as a replacement). Therefore it is possible that the associations observed in this chapter have been under-estimated due to combinations of childcare used rather than the main childcare type alone (for example children looked after in formal childcare may also experience some "wrap-around" care which is informal). The analyses were therefore repeated only in children who were looked after in one type of childcare (see Appendix 6, Table 6A1). The results from the first sweep were largely unchanged, and in fact the elevated risks in formal childcare in the less advantaged

groups increased. At the second sweep the results were also very similar, with the exception of the elevated risk seen in infants living in couple families and looked after in informal childcare, which remained significant after adjusting for confounders, (in contrast to the main analysis where it was no longer significant). These sensitivity analyses imply that associations observed in this chapter may have been diluted to some extent due to exploring only the main childcare type.

**Excluding children who were looked after by nannies and au pairs**

Nannies and au pairs were classified as formal childcare (using the same classification as a large national survey of childcare in the UK[151]), although they might also be considered informal carers as they do not necessarily have qualifications in childcare and may not be subject to regulation. It therefore might be argued that nannies and au pairs should not have been classified as formal childcare. However when the analyses were repeated, excluding children who were looked after by nannies and au pairs, the results were unchanged (see Appendix 6, Table 6A2). Nannies and au pairs were recorded in the same category as neighbours and friends in the second sweep questionnaire, and therefore had to be classified as informal childcare. Therefore it was not possible to remove them from the analysis to observe what effect this may have had on the risk of injury from 9 months to 3 years in informal childcare. This limits the direct comparison of findings between the two sweeps, however the fact that removing nannies and au-pairs from the first sweep analysis made little difference, and that numbers of nannies and au pairs were low at the age 9 months (174), indicates that any bias will not be substantial.

## 6.5 Discussion

### *6.5.1 Summary of findings*

Overall, childcare use was not associated with the risk of injury at age 9 months. However, when stratifying by socio-economic background, formal childcare appeared to have a protective effect against injury for those from more advantaged groups and a detrimental effect for those from less advantaged SECs. At age 3 years informal childcare was associated with a small increased risk of injury in children from less advantaged backgrounds. There was no difference in risk for children cared for in formal childcare compared to those cared for only by a parent. There were no significant associations when stratifying by lone parenthood status at either time point.

### *6.5.2 Strengths and limitations*

The general strengths and limitations of the MCS data are discussed in Chapters 3 (3.2.5) and 4 (4.2.5). This is the first study, to my knowledge to have explored the association between childcare and injury in the UK, or in different social strata. In addition to this, it was possible to differentiate between informal and formal childcare types, and to adjust for a range of potential confounding factors (which rarely altered the results). As discussed in Chapter 3, injury was based on maternal report of the child having visited a doctor, health centre or hospital. It was not possible to determine whether the injuries occurred when in childcare. Therefore, it was not possible to establish whether childcare influenced the risk of injury for the time when the child was in childcare, or if health education occurring in the childcare setting influenced risk taking behaviours elsewhere or safety within the home. Whilst most studies have compared the incidence of injury in childcare to the incidence of injury at home[190-192], one US study found that the children who attended childcare centres had a slightly lower risk of being injured anywhere[193]. This implies that childcare influences the risk of injury outside the childcare setting, for example through health education.

A simple categorisation of informal and formal childcare was used, in order to maximise power and for comparison with previous findings. However it is possible that secondary childcare arrangements were also influencing injury risk or that the inclusion of nannies and au pairs in the definition of formal childcare were driving the elevated risks seen at 9 months. The analyses were repeated excluding children who attended more than one type of childcare, and also excluding children who were looked after by nannies and au pairs, and the associations were little changed.

Childcare attendance is not random[193]. Whilst a range of potential confounders have been controlled, either through adjustment or stratification of results (using the four measures of SECs), it is still possible that families using childcare differ from those who do not in some way that has not been captured by these measures. The stratification of results according to a number of measures could lead to false positives and negatives due to over-testing, and because effect modification was not a prerequisite for stratification, between group comparisons cannot be made. These issues are discussed further in Chapter 11.

### *6.5.3 Comparison with other findings*

Four studies have found that children looked after in formal childcare are less likely to be injured, three of which investigated injury rates (in "child hours") in childcare or at home. One study, conducted in the US in 1987 and collected via telephone survey, explored injury rates (requiring a hospital or GP visit) according to childcare type (defined as "out of home care" or "home care only") and where the injury took place (childcare or at home)[192]. The injury rate was lower in childcare than home care in children aged 18-35 months and 36-59 months, although the difference was only statistically significant for the younger age group. In infants aged six weeks-17 months rates were higher for home care, although not significantly so. A second US study, also conducted in the mid-1980s using surveillance data, demonstrated a reduced rate of medically attended injury in preschool children per child hour spent in childcare compared to home care[190], both overall and in different age groups (although the differences did not reach statistical significance). In agreement with this, a third study set in the early 1990s in Norway and using registration data, found that injury rates (per one hundred thousand child hours) were lower in childcare settings than at home, for all children age six months to six years. However when breaking down by age, only children aged six months to two years were at increased risk of injury at home compared to childcare (and there were no differences for those aged three to six years)[191]. No significant differences were found in the severity of injuries.

The remaining study to find a lower risk of injury associated with formal childcare attendance, also set in the US, explored the risk of injuries (based on maternal report) occurring anywhere, according to childcare use. They found that children who were cared for in registered childcare centres were less likely to be injured than those who were only cared for at home (typically by a parent or relative)[193]. The analyses reported in this chapter also explored the risk of injuries occurring anywhere in relation to main childcare type, but found no overall reduction in risk for infants or children looked after in formal childcare. The inconsistencies between the findings from this chapter and those from other studies (which found a lower risk of injury in formal childcare) might be explained by the different age groups or time periods in which the observations were made. When stratifying by SECs, infants from more advantaged groups appeared to be less likely to be injured if they were looked after in formal childcare compared to those looked after only at home. It is therefore also possible that the overall beneficial effect of childcare observed in previous studies is explained by relatively advantaged study samples. Information on childcare quality was not available in the MCS so it was not

possible to explore whether variations in the association between childcare and injury is due to varying levels in the quality of care for different social groups. Studies which have explored formal childcare quality found no overall association with injury in children aged two-six years[194] and six months to five years[193], although no study, to my knowledge, has focussed on the issue of quality specifically in infants.

Only two studies explored the association between informal childcare and injury, both set in the US in the 1990s, and both exploring injuries that occurred anywhere. One, which was also reported above[193], explored informal and formal childcare in relation to injuries and observed a small but statistically significant lower risk of injury the longer children spent in both types of childcare settings[193]. The other sought to explore whether care by grandparents increased the risk of injury in children aged two-three years by comparing the odds of medically attended injuries in children who were and were not looked after by grandparents. Children who were looked after by a grandparent had a reduced odds of being injured (of around 20%), although it was only significant at the 10% level. The authors therefore concluded that being cared for by a grandparent does not increase the risk of being injured[195]. In contrast to findings from both of these studies, this chapter implies that children looked after by informal carers (the majority of whom are grandparents) between the age of 9 months and 3 years are at a small increased risk of injury.

It has been hypothesised that increasing childcare use may widen inequalities due to higher socio-economic groups being able to afford higher quality childcare[86;145]. This study is the first, to my knowledge, to have explored the association between childcare and childhood injury in different social groups, and findings from this chapter go some way to support this hypothesis, since those from less advantaged backgrounds experienced a greater risk of injury in childcare than those from more advantaged families (measured by NS-SEC, maternal education and area deprivation). However there were no significant associations seen in the analyses stratified by lone parenthood.

### *6.5.4 Implications for research, policy and practice*

Findings from other studies from outside the UK, imply that, overall, formal childcare use is associated with a lower risk of injuries occurring both in childcare and elsewhere (although existing evidence indicates that there is no difference in terms of injury severity [190;191]). However findings presented here only found this to be the case for

infants from more advantaged backgrounds. In contrast infants from less advantaged backgrounds were more likely to be injured if they were looked after in formal childcare. Formal childcare was not associated with the risk of injury at age 3 years. If these associations are causal (and this is not being assumed), then increasing the number of infants cared for in formal childcare without addressing potential factors that might cause these differential effects, such as quality and affordability, could widen inequalities in injury.

By age 3 years, when uptake of formal childcare was higher, the overall risk of injury for children who were cared for in formal childcare was no longer different from for those cared for only by a parent. There was also no variation by socio-economic group. It is possible that the provision of free early education places for children aged three-four years may, to some extent, have been 'levelling up' the quality of childcare experienced by children in lower socio-economic groups, although it was not possible to explore this in the MCS. Alternatively, the quality of formal childcare may become less influential for injury risk as children become older. This is supported by the lack of an association between childcare quality and injury in children aged two-six years[194] and six months to five years[193], as previously reported. The differential associations might also be explained by variations in the ability of families to transfer the health promoting benefits of childcare to the home and other settings.

If it is continued under the new coalition government, the Labour government's proposal in 2004 to improve education and training for childcare staff[17] could help to raise the standard of formal childcare received by infants from lower socio-economic groups further, and therefore has the potential to reduce inequalities in infant injury. The extension of the provision of free childcare places to two-year-olds living in deprived areas[142] may have helped to equalise the quality of formal childcare received by this younger age group, although it was not possible to test this empirically using MCS data. Findings from this chapter suggest that extending the free provision to infants may be effective in the reduction of inequalities in injury, since it was in this age group that differential associations were observed.

The previous government's move to increase the proportion of childminders who are registered[17] might reduce the detrimental impact of informal childcare upon injury in children from lower socio-economic groups, by decreasing exposure to informal (or

unregulated) childcare. However there are some reservations about the limited requirements for registration and whether these are likely to influence the quality of childcare received[196]. Efforts focussed on increasing awareness and improving the safety of home environments of informal carers living in more deprived areas and poorer households could have a beneficial effect for children cared for by friends, neighbours and relatives. In Chapter 5 it was shown that aspects of the home environment are unlikely to influence inequalities in injury, although improvements to other home environments that children are exposed to may have a beneficial effect. The majority of informal carers are grandparents and so information and support should be made available to them, for example through the recently launched website for grandparents www.begrand.net which offers expert advice and an online community for the exchange of ideas and advice. The promise made by the Labour government in 2009 to provide grandparents with National Insurance credits for caring for grandchildren (under the age of 13 for at least 20 hours a week) from 2011[144] may also provide a potential avenue for accessing this group (if continued by the current government).

## 6.6 Summary of findings

- There was no association between childcare use and unintentional injuries in infants between birth and 9 months in the overall analysis, however those from more advantaged backgrounds were less likely to be unintentionally injured if they were cared for in formal childcare (compared to those cared for only by a parent) whereas those from less advantaged backgrounds were more likely to be injured.
- Similarly there was no association between childcare use and injury between 9 months and 3 years, although when exploring the association in different socio-economic groups, an increased risk of injury was observed in children looked after in informal childcare if they were from less advantaged backgrounds. There was no association between formal childcare use and injury in any group between 9 months and 3 years.

This chapter explored a link bridging the injury case study and the childcare case study. In Chapter 7, the second link for the childcare case study is investigated: childcare and breastfeeding.

# 7 Chapter 7 – Childcare use and inequalities in breastfeeding

In Chapter 2 the association between childcare and breastfeeding was selected as the second link to be explored in Phase 2 for the childcare case study. Chapter 4 described trends and inequalities according to main childcare type between birth and 9 months and 9 months and 3 years. In this chapter trends and inequalities in breastfeeding and childcare in early infancy (i.e. before the age of 4 months) are reported. Following this, the association between these measures of childcare and breastfeeding is investigated, overall and in different socio-economic circumstances (SECs).

Some of the results from this chapter have been published previously in the following short report: Pearce et al. Childcare use and inequalities in breastfeeding. Findings from the UK Millennium Cohort Study". Archives of Disease in Childhood. 2010. Online first. doi:10.1136/adc.2009.177337 (Appendix 1).

## 7.1 Objectives

- To establish trends and inequalities in breastfeeding (7.2)
- To establish trends and inequalities in childcare in early infancy (7.3)
- To explore the association between childcare use and breastfeeding, and whether it differed by SECs, using data from the Millennium Cohort Study (MCS) (7.4)

## 7.2 Breastfeeding: trends and inequalities

### *7.2.1 Background*

Breastfeeding is associated with a wide range of health benefits to the mother and child[197] and in 2003 the World Health Organization (WHO) introduced the recommendation that infants be exclusively breastfed for six months[198]. In 2001, when the Millennium Cohort children were infants, the government recommendation in the UK was that infants be exclusively breastfed for at least four months[97]. However, results from the Infant Feeding Survey (IFS) indicate that in 2005 only 7% of mothers in the UK exclusively breastfed for at least four months and less than 1% exclusively breastfed for at least six months. In addition to this, breastfeeding is socially distributed, with those from lower socio-economic groups displaying lower rates of breastfeeding[28]. Breastfeeding therefore featured highly on the Labour government agenda. In 2008 the cross-government strategy "Healthy Weight, Healthy Lives" aimed to make breastfeeding "the norm for parents"[199] and a Public Service Agreement (PSA) goal was

agreed for the period 2008-11 to increase the proportion of infants who are breasted for at least six-eight weeks[200]. This target was supported by the Children's Plan[11], the Healthy Child Programme (a programme of screening tests, immunisations, developmental reviews, and information and guidance, including on breastfeeding)[19]and international schemes such as the UNICEF Baby-Friendly Hospital scheme (which works with the health-care system to ensure a high standard of care for pregnant women and breastfeeding mothers and babies)[201], and the development of new WHO growth standards devised using data on breastfed children across several countries[202]. Since 2003 primary care trusts (PCTs) in England have been required to submit quarterly returns on breastfeeding initiation. From 2008 they were also required to submit data on the proportion of women breastfeeding for at least six-eight weeks (in order to monitor progress towards the PSA goal).

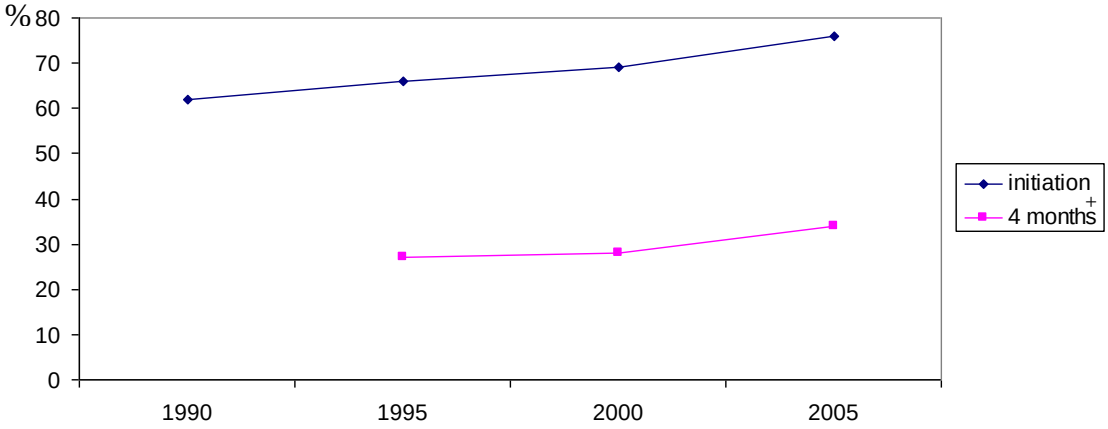
When exploring breastfeeding duration in this programme of work, the prevalence of breastfeeding for at least four months was considered, because this was the government recommendation at the time that the MCS children were infants. However due to the low proportions of mothers who breastfed exclusively for this period (4%), breastfeeding any amount (partially or exclusively) is explored.

### *7.2.2 Trends in breastfeeding*

The proportion of mothers who initiate breastfeeding has increased steadily in recent years, as demonstrated by data for the UK from the IFS. In 1990 approximately 62% of mothers in the IFS initiated breastfeeding; by 2005 this had increased to around 76% (Figure 7.1).

Whilst over three quarters of mothers initiated breastfeeding in 2005 in the IFS, only 34% breastfed for at least four months (17 weeks). However, this was an improvement on previous figures; in 1995 27% of mothers breastfed for at least four months and 28% in 2000. PCT data indicate that 73% of mothers were breastfeeding in England by the last quarter of 2009/10, however only 48% were breastfeeding at six-eight weeks and only 14% were doing so exclusively[203].

*Figure 7.1: Proportion of mothers who initiated breastfeeding (1990-2005), and who breastfed for at least 4 months (1995-2005), IFS, UK*




### *7.2.3 Prevalence and inequalities in breastfeeding, in the MCS*

Similar to initiation rates in the IFS in 2000 (68%), approximately 67% of mothers in the MCS initiated breastfeeding. Only half of these mothers breastfed for at least 4 months (33%) (Table 7.1), compared to 28% observed in the IFS in 2000.

*Table 7.1: Breastfeeding initiation and duration (for at least 4 months) in the MCS: weighted % (N)*

| **Breastfeeding duration** | **Weighted % (N)** |
|---|---|
| Never | 30.4 (6,237) |
| Less than 4 months | 37.0 (6,638) |
| More than 4 months | 32.6 ( 5,360) |

Missing (initiation and duration): 24

Table 7.2 shows the prevalence of breastfeeding for at least 4 months in the MCS according to socio-economic circumstances (SECs), and relative and absolute differences between each level of SECs (with the most advantaged group for each measure as the baseline). There were consistent and statistically significant inequalities in breastfeeding; mothers who were from lower social classes, were less educated, lone parents, or living in more deprived areas were less likely to breastfeed than more advantaged mothers. For example mothers who had no educational qualifications were 4 times less likely to breastfeed for at least 4 months than mothers who were educated to degree level (relative difference (RD)=0.25 [0.22, 0.29]), with an absolute difference (AD) of -47.22% [-50.30, -44.15]. Lone mothers were less than half as likely to breastfeed compared to mothers living as a couple (RD=0.47 [0.41, 0.54]; AD=-18.57% [-20.92, -16.23]).

*Table 7.2: Breastfeeding for at least 4 months in the MCS, by SECs: weighted % (N), and relative and absolute differences (95% CIs), with most advantaged groups as the baseline*

| | % (N) | Relative difference (95% CI) | Absolute difference (95% CI) |
|---|---|---|---|
| **Breastfed for 4 months or more** | | | |
| *NS-SEC* | | | |
| Managerial | 49.7 (2218) | - | - |
| Intermediate | 34.8 (1185) | 0.70 (0.66, 0.75)* | -29.64 (-31.96, -27.32)* |
| Routine | 20.0 (1384) | 0.40 (0.38, 0.43)* | -14.86 (-17.61, -12.12)* |
| *Education* | | | |
| Degree + | 63.4 (1707) | - | - |
| Diploma | 40.8 (589) | 0.64 (0.59, 0.70)* | -22.58 (-26.07, -19.09)* |
| A Levels | 41.7 (626) | 0.66 (0.61, 0.71)* | -21.72 (-24.97, -18.47)* |
| GCSE A-C | 24.0 (1309) | 0.38 (0.35, 0.40)* | -39.42 (-42.04, -36.80)* |
| GCSE D-G | 15.4 (285) | 0.24 (0.21, 0.27)* | -47.98 (-50.82, -45.15)* |
| No qualifications | 16.1 (590) | 0.25 (0.22, 0.29)* | -47.22 (-50.30, -44.15)* |
| *Lone parenthood* | | | |
| Couple families | 35.3 (4872) | - | - |
| Lone parents | 16.7 (488) | 0.47 (0.41, 0.54)* | -18.57 (-20.92, -16.23)* |
| *IMD (quintile)*^ | | | |
| Least deprived | 45.4 (641) | - | - |
| 4 | 43.1 (650) | 0.95 (0.87, 1.03) | -22.15 (-25.13, -19.17)* |
| 3 | 33.9 (701) | 0.75 (0.68, 0.81)* | -17.32 (-20.56, -14.07)* |
| 2 | 28.1 (754) | 0.62 (0.57, 0.68)* | -11.51 (-14.96, -8.06)* |
| Most deprived | 23.3 (1054) | 0.51 (0.47, 0.56)* | -2.27 (-5.93, 1.39)* |

*P<=0.05. ^ England only. Missing: breastfeeding-24, NS-SEC 245, maternal education- 66, area deprivation- 2.

## 7.3 Childcare in early infancy: trends and inequalities

### *7.3.1 Background*

In this chapter childcare use commencing before the age of four months and lasting, on average, at least 10 hours a week is explored in relation to breastfeeding for at least four months. Childcare which commenced before the age of four months but lasted on average for less than 10 hours a week was reclassified as parental care (only), since it was unlikely that shorter durations of childcare would impact infant feeding habits.

Childcare policies in the UK have been discussed previously in this thesis (Chapter 4). These tended to focus on childcare at later ages (for example by providing free places to two year olds living in deprived areas), although increases in the childcare element of

the Working Tax Credits in the past few years may have had an upward influence on formal childcare uptake (including during infancy) and steps to improve training may have led to improvements in the quality of childcare received.

### *7.3.2 Trends in childcare in early infancy*

Data to assess trends in childcare in early infancy (e.g. before the age of 4 months) are not routinely available from national surveys (the IFS started asking childcare questions in 2000). The drive to encourage mothers to return to paid employment may have influenced the likelihood of mothers using childcare in infancy and other ages. On the other hand, statutory maternity pay and maternity allowance was extended in recent years, from 18 weeks to 26 weeks in 2003, and then again to 39 weeks in 2006. Employed mothers now also have the option to take unpaid leave in addition to the period covered by maternity pay, providing them with a full year's leave[204]. This may have delayed the time that women return to work[204]. According to data from the IFS, in 2005 20% of mothers who returned to work did so before the baby was five months old, down from 30% in 2000[28].

### *7.3.3 Prevalence and inequalities in childcare in early infancy, in the MCS*

Compared to childcare use in the MCS over the period from birth and 9 months (Chapter 4) (when 40% of infants were looked after in non-parental care), childcare before the age of four months (and lasting at least 10 hours a week) was relatively low. 7% of infants were cared for in informal childcare for at least 10 hours a week before the age of four months, and 2% were cared for in formal childcare (Table 7.3).

*Table 7.3: Childcare use commencing before the age of 4 months (and lasting at least 10 hours a week) in the MCS: weighted % (N)*

| **Childcare before 4 months** | % (N) |
|---|---|
| Parent only | 90.7 (16,284) |
| Informal | 7.0 (1430) |
| Formal | 2.3 (360) |

Missing: 185

Table 7.4 below shows the proportion of mothers who reported using childcare before their baby turned four months old (for at least 10 hours a week), according to SECs. Relative inequalities in parental only and formal care tended to be less extreme than seen for childcare use between birth and 9 months, whereas the socio-economic gradient

of informal childcare was slightly more extreme. Mothers from more deprived backgrounds were slightly less likely to only use parental care than those from the most advantaged groups, for example those living in the most deprived areas in England were 3% less likely to only use parental care (RD=0.97 [0.95, 0.99]) than those from the most advantaged areas, with an absolute difference of -2.79% (-4.50, -1.09). Those from more disadvantaged groups were more likely to use informal childcare and less likely to use formal childcare than those from more advantaged groups. For example, compared to mothers with a degree, mothers who had no educational qualifications were more than twice as likely to use informal childcare (RD=2.20 [1.66, 2.91]; AD=3.79% [2.5, 5,12]) and ten times less likely to use formal childcare (RD=0.10 [0.05, 0.18]; AD=-4.59% [-5.59, -3.58]).

*Table 7.4: Childcare (of at least 10 hours a week) commencing before age 4 months in the MCS, according to SECs: weighted % (N), and relative and absolute differences (95% CIs), with most advantaged group as the baseline*

| | **Parent** | | | Informal | | | Formal | | | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|
| | % (N) | Relative difference (95% CI) | Absolute difference (95% CI) | % (N) | Relative difference (95% CI) | Absolute difference (95% CI) | % (N) | Relative difference (95% CI) | Absolute difference (95% CI) | % |
| *NS-SEC* | | | | | | | | | | |
| Managerial | 90.1 (4208) | - | - | 5.2 (284) | - | - | 4.8 (206) | - | - | 100 |
| Intermediate | 89.8 (3227) | 1.00 (0.98, 1.01) | -0.27 (-1.75, 1.20) | 8.0 (329) | 1.55 (1.28, 1.87)* | 2.81 (1.56, 4.07)* | 2.2 (81) | 0.47 (0.34, 0.64)* | -2.54 (-3.47, -1.61)* | 100 |
| Routine | 91.1 (6858) | 1.01 (1.00, 1.03)* | 1.04 (-0.20, 2.28) | 8.0 (682) | 1.56 (1.31, 1.85)* | 2.87 (1.82, 3.93)* | 0.9 (58) | 0.18 (0.13, 0.25)* | -3.92 (-4.63, -3.20)* | 100 |
| *Education* | | | | | | | | | | |
| Degree + | 91.8 (2578) | | | 3.2 (114) | - | | 5.1 (130) | - | - | 100 |
| Diploma | 91.2(1353) | 0.99 (0.97, 1.01) | -0.58 (-2.34, 1.18) | 6.0 (108) | 1.89 (1.40, 2.56)* | 2.82 (1.38, 4.26)* | 2.9 (42) | 0.56 (0.38, 0.82)* | -2.24 (-3.57, -0.91)* | 100 |
| A Levels | 88.9 (1484) | 0.97 (0.95, 0.99)* | -2.86 (-4.92, -0.80)* | 7.5 (141) | 2.36 (1.74, 3.20)* | 4.31 (2.72, 5.91)* | 3.6 (50) | 0.71 (0.50, 1.02) | -1.45 (-2.89, -0.01)* | 100 |
| GCSE A-C | 90.0 (5365) | 0.98 (0.97, 1.00)* | -1.75 (-3.20, -0.30)* | 8.3 (574) | 2.62 (2.06, 3.33)* | 5.11 (4.01, 6.20)* | 1.7 (97) | 0.34 (0.25, 0.46)* | -3.36 (-4.39, -2.33)* | 100 |
| GCSE D-G | 89.2 (1724) | 0.97 (0.95, 0.99)* | -2.54 (-4.56, -0.52)* | 9.7 (196) | 3.06 (2.33, 4.02)* | 6.51 (4.79, 8.23)* | 1.1 (21) | 0.22 (0.13, 0.37)* | -3.97 (-5.06, -2.88)* | 100 |
| No qualifications | 92.5 (3238) | 1.01 (0.99, 1.03) | 0.79 (-0.76, 2.35) | 7.0 (260) | 2.20 (1.66, 2.91)* | 3.79 (2.47, 5.12)* | 0.5 (15) | 0.10 (0.05, 0.18)* | -4.59 (-5.59, -3.58)* | 100 |
| *Lone parenthood* | | | | | | | | | | |
| Couple families | 91.2 (13547) | - | - | 6.6 (1113) | - | - | 2.3 (298) | - | - | 100 |
| Lone parents | 87.8 (2737) | 0.96 (0.95, 0.98)* | -3.32 (-4.83,-1.81) | 9.5(317) | 1.45 (1.25, 1.68)* | 2.95 (1.68,4.22,)* | 2.7 (62) | 1.16 (0.85, 1.58) | -0.37 (-1.16, 0.42) | 100 |
| *IMD (quintile)*^ | | | | | | | | | | |
| Least deprived | 93.2 (1287) | - | - | 3.5 (48) | - | - | 3.4 (43) | - | - | 100 |
| 4 | 91.5 (1366) | 0.98 (0.96, 1.00)* | -1.68 (-3.64, 0.29) | 5.2 (78) | 1.48 (1.03, 2.11)* | 1.67 (0.17, 3.16)* | 3.4 (51) | 1.00 (0.67, 1.49) | 0.01 (-1.32, 1.34) | 100 |
| 3 | 90.6 (1748) | 0.97 (0.95, 0.99)* | -2.61 (-4.54, -0.67) | 7.1 (134) | 2.03 (1.46, 2.82)* | 3.60 (2.04, 5.16)* | 2.4 (42) | 0.70 (0.46, 1.08) | -0.99 (-2.21, 0.22) | 100 |
| 2 | 90.0 (2199) | 0.97 (0.95, 0.99)* | -3.17 (-5.02, -1.32) | 7.9 (202) | 2.27 (1.66, 3.11)* | 4.44 (2.94, 5.94)* | 2.1 (51) | 0.62 (0.41, 0.93)* | -1.27 (-2.41, -0.14)* | 100 |
| Most deprived | 90.4 (3621) | 0.97 (0.95, 0.99)* | -2.79 (-4.50, -1.09) | 8.5 (323) | 2.43 (1.80, 3.29)* | 5.00 (3.61, 6.38)* | 1.2 (37) | 0.34 (0.22, 0.54)* | -2.20 (-3.25, -1.16)* | 100 |

*P<=0.05. ^ England only. Missing: childcare- 185, NS-SEC 245, maternal education- 66, area deprivation- 2.

## 7.4 Exploring the association between childcare and inequalities in breastfeeding

### *7.4.1 Background*

The majority of research exploring childcare and infant feeding has been conducted in the US. A survey of childcare facilities in 50 US states and the District of Columbia (which are individually responsible for childcare regulations in their catchment area) found that only nine (18%) states had regulations expressing support for breastfeeding and provision of breast milk in childcare centres and only three (6%) states had a statement of support for breastfeeding for childminders[205]. A survey of childcare providers in Colorado, published in 2008, found that childcare providers' knowledge about the preparation and storage of breast milk was low. Despite this, 65% of infants aged nought-two months were fed breast milk whilst in childcare centres (declined to 31% by four-six months)[206]. A systematic review identified a US study which found that some childcare providers felt uneasy handling breast milk, whilst another reported that working mothers were more likely to breastfeed if there was childcare available onsite or close by[207].

A small number of studies have attempted to quantify the association between childcare use and the likelihood of breastfeeding[63;208-212], half based in the US[208;209;212] and the others in New Zealand[211], Denmark[210] and UK[63]. The majority of these studies made no differentiation between informal and formal types of childcare [208-211], and all found that childcare was associated with a lower likelihood of breastfeeding. One US study, which explored the impacts of informal and formal childcare on breastfeeding separately, found that infants who were looked after in all types of childcare were less likely to be breastfed. Infants who were cared for by relatives were the least likely to be breastfed, followed by those looked after by non-relatives, and then formal childcare[212]. The only study (to my knowledge) exploring the relationship between childcare and breastfeeding in the UK, did so in a paper which aimed to explore the potential impact of employment status and workplace characteristics on breastfeeding duration[63]. The analysis, conducted using MCS data, was limited to mothers in paid employment and found that mothers who used informal childcare at any point from birth to 9 months were less likely to breastfeed for at least four months than infants who were looked after only by a parent. In contrast infants who were looked after in formal childcare were more likely to have been breastfed than those who were looked after only by a parent, although this elevated likelihood was no longer significant after controlling for socio-demographic

characteristics. Despite breastfeeding being socially distributed, to my knowledge no study has explored the association in different socio-economic groups.

This chapter explores the association between childcare and breastfeeding in the UK, differentiating between informal and formal childcare, overall and in different socio-economic groups.

### *7.4.2 Methods*

**Participants**

The analyses in this chapter include 18,050 (99%) infants for whom information on both childcare and breastfeeding were available at age 9 months.

**Measurements**

Explanatory measures: Childcare

As outlined in Chapter 2 (and Appendix 2), for the period between birth and 9 months mothers reported if they used childcare whilst they were at work or at other times. They were classified according to the first reported non-parental care type, using the categories informal and formal childcare. Mothers also reported the age at which childcare commenced and on average (across the entire 9 month period) how many hours per week they were in childcare for. In this analysis childcare commencing before the age of four months is explored, because the outcome measure is breastfeeding for at least four months. It is also limited to childcare which lasted on average for at least 10 hours a week, since periods of less than this would be unlikely to influence infant feeding patterns (bearing in mind the analysis is looking at the influence of childcare on any amount of breastfeeding rather than exclusive breastfeeding). Therefore infants, who were looked after in non-parental care after the age of 4 months or for less than 10 hours a week on average between birth and 9 months, were reclassified as being looked after only by a parent.

Outcome measures: Breastfeeding

At the first sweep MCS mothers were asked if they ever tried to breastfeed their child and if so at what age the child had last received breast milk. Infants were categorised as having been breastfed (exclusively or partially) for at least 4 calendar months (>=17.4 weeks), with those who did not initiate or who breastfed for less than 4 months as the

baseline, since at the time of the MCS births this was the duration recommended by the UK government [97].

Socio-economic circumstances

The four measures of socio-economic circumstances (SECs) outlined in Chapter 2 were used for this analysis: NS-SEC, maternal education, lone parenthood and area deprivation, which were all captured at age 9 months.

Confounders

Several potential confounders were explored. As in the other chapters, the mother's ethnicity and maternal age at first live birth were adjusted for. Parity was adjusted for, rather than number of children in the household (as in other analyses), because it had been identified as a potential confounder in other breastfeeding studies exploring breastfeeding in the MCS[29;30;213]. Whether the mother returned to work before the infant was four months old was also adjusted for, since maternal employment has previously been found to be associated with the likelihood of breastfeeding in the MCS[63].

**Analysis**

Two approaches to exploring the impact of policies on inequalities in health are used in this thesis, as outlined in Chapter 2. In this chapter the second method is used, which explores whether the impact of a policy varies for different social groups. It is feasible that the association between childcare and breastfeeding would vary in different social groups, for example due to differing levels of support or facilities to enable the use of expressed milk.

Firstly the overall association between childcare and breastfeeding was explored, using Poisson regression to estimate the likelihood of having been breastfed for at least four months according to childcare type (with care only by a parent as the baseline). Unadjusted and adjusted risk ratios were then estimated according to time spent in childcare, because it was thought that longer periods of time spent away from the parent could reduce the likelihood of breastfeeding further (unlike in Chapter 5, where it was hypothesised that any amount of childcare could influence injury risk). Childcare was classified as part-time if it lasted between 10 and 30 hours a week, and as full-time if it lasted for 31 hours or more. Following this the unadjusted and adjusted analyses were repeated stratified by each of the SECs measures, in order to observe whether the

association varied by social background. A number of sensitivity analyses were also conducted to address some of the limitations of the data. These are discussed after the main results.

### *7.4.3 Results*

**Association between childcare and breastfeeding**

Overall, infants who were looked after in informal childcare were half as likely to be breastfed than infants who were cared for only by a parent, after adjustment for confounding factors (Table 7.5, Col C). When exploring the association according to time spent in childcare, those who were looked after in full-time informal childcare (aRR=0.42 [0.28, 0.64]) and part-time informal childcare (aRR=0.54 [0.45, 0.63]) were less likely to be breastfed, compared to infants who were looked after only by a parent. For formal childcare (compared to those cared for only by a parent), a similar but less pronounced association emerged only after controlling for confounders (aRR=0.84 [0.72, 0.99]). However when exploring time spent in formal childcare, the lower likelihood was only observed for full-time (and not part-time) formal childcare (aRR=0.68 [0.51, 0.92]).

In the stratified analyses, the proportion of mothers who breastfed was consistently lower in the less advantaged groups, across all childcare types (Table 7.6, Col A). The reduced likelihood of breastfeeding in informal childcare compared to parental care only was seen in all socio-economic groups at levels fairly similar to those seen in the overall analysis, with one exception: mothers who had a degree who used informal childcare were not significantly different from those who only used parental care (aRR=0.82 [0.64, 1.06]).

*Table 7.5: Association between childcare commencing before the age of 4 months and breastfeeding for at least 4 months in the MCS: unadjusted and adjusted risk ratios (RR (95% CIs), overall and by average duration*

| **Breastfed for at least 4 months, according to childcare commencing before age 4** | | | |
|---|---|---|---|
| | *Col A* | *Col B* | *Col C* |
| | *%(N)* | *RR* | *ARR^* |
| Overall association | | | |
| Parent | 34.1 (5003) | - | - |
| Informal | 13.7 (187) | 0.40 (0.35, 0.47)* | 0.51 (0.43, 0.59)* |
| Formal | 31.3 (103) | 0.92 (0.78, 1.08) | 0.84 (0.72, 0.99)* |
| Stratified by hours | | | |
| Parent | 34.1 (5003) | - | - |
| Informal P/T | 14.0 (153) | 0.41 (0.35, 0.49)* | 0.54 (0.45, 0.63)* |
| Informal F/T | 12.5 (34) | 0.37 (0.25, 0.55)* | 0.42 (0.28, 0.64)* |
| Formal P/T | 36.0 (63) | 1.06 (0.87, 1.29) | 1.01 (0.82, 1.24) |
| Formal F/T | 25.9 (40) | 0.76 (0.56, 1.03) | 0.68 (0.51, 0.92)* |

*p<0.05. ^adjusting for mother's ethnicity, parity, age at first live birth, whether the mother returned to work before the infant was age 4 months. Missing: breastfeeding-24, childcare- 185, ethnicity- 48, parity- 635, maternal age at first live birth- 653.

Formal childcare was only associated with a reduced likelihood of breastfeeding in mothers from the most advantaged backgrounds and in couple families, both before and after adjustment. In contrast, infants of lone mothers were significantly more likely to breastfeed of they were cared for in formal childcare (aRR=1.65 [1.04, 2.63]) compared to those who were only looked after by a parent. Mothers who had no educational qualifications also appeared to be more likely to breastfeed if they used formal childcare, although this did not reach statistical significance (aRR=2.20 [0.94, 5.14]), possibly due to the small numbers in this group (n=5).

*Table 7.6: Association between childcare commencing before the age of 4 months and breastfeeding for at least 4 months in the MCS: unadjusted and adjusted risk ratios (RR (95% CIs), by SECs*

| | **%(N) breastfed** | **Unadjusted RR (95% CI)** | **Adjusted RR (95% CI)**** |
|---|---|---|---|
| | *Col A* | *Col B* | *Col C* |
| *Routine & Manual* | | | |
| Parent | 21.0 (1307) | | |
| Informal | 8.3 (50) | 0.39 (0.29, 0.54)* | 0.47 (0.34, 0.66)* |
| Formal | 11.9 (5) | 0.57 (0.24, 1.34) | 0.54 (0.21, 1.36) |
| *Intermediate* | | | |
| Parent | 36.6 (1099) | | |
| Informal | 16.0 (50) | 0.44 (0.33, 0.58)* | 0.50 (0.37, 0.67)* |
| Formal | 20.6 (22) | 0.83 (0.56, 1.25) | 0.84 (0.57, 1.23) |
| *Managerial & Prof* | | | |
| Parent | 52.0 (2062) | | |
| Informal | 20.5 (60) | 0.39 (0.30, 0.51)* | 0.50 (0.39, 0.65)* |
| Formal | 36.2 (70) | 0.70 (0.58, 0.85)* | 0.76 (0.62, 0.94)* |
| **Education** | | | |
| *No qualifications* | | | |
| Parent | 16.8 (553) | | |
| Informal | 6.8 (25) | 0.40 (0.24, 0.69)* | 0.44 (0.26, 0.76)* |
| Formal | 22.0 (5) | 1.31 (0.51, 3.36) | 2.20 (0.94, 5.14) |
| *GCSE D-G* | | | |
| Parent | 16.3 (269) | | |
| Informal | 6.2 (10) | 0.38 (0.19, 0.75)* | 0.47 (0.24, 0.91)* |
| Formal | 6.0 (1) | 0.59 (0.09, 3.70) | 0.51 (0.10, 2.57) |
| *GCSE A-C* | | | |
| Parent | 25.5 (1237) | | |
| Informal | 7.5 (39) | 0.30 (0.21, 0.42)* | 0.35 (0.24, 0.50)* |
| Formal | 21.0 (16) | 0.82 (0.51, 1.32) | 0.83 (0.52, 1.33) |
| *A Levels* | | | |
| Parent | 43.8 (577) | | |
| Informal | 20.5 (27) | 0.47 (0.32, 0.70)* | 0.60 (0.40, 0.89)* |
| Formal | 37.1 (17) | 0.85 (0.56, 1.29) | 1.04 (0.66, 1.63) |
| *Diploma* | | | |
| Parent | 42.5 (547) | | |
| Informal | 24.5 (26) | 0.58 (0.39, 0.84)* | 0.66 (0.45, 0.95)* |
| Formal | 15.9 (7) | 0.37 (0.18, 0.78)* | 0.40 (0.18, 0.86)* |
| *Degree* | | | |
| Parent | 64.9 (1580) | | |
| Informal | 46.5 (48) | 0.72 (0.57, 0.90)* | 0.82 (0.64, 1.06) |
| Formal | 44.6 (56) | 0.69 (0.56, 0.84)* | 0.71 (0.58, 0.86)* |
| **Lone parenthood** | | | |
| *Lone parent* | | | |
| Parent | 17.3 (440) | - | |
| Informal | 6.6 (21) | 0.38 (0.23, 0.63)* | 0.40 (0.25, 0.65)* |
| Formal | 33.8 (20) | 1.95 (1.28, 2.99)* | 1.65 (1.04, 2.63)* |
| *Couple family* | | | |
| Parent | 36.8 (4563) | - | |
| Informal | 15.5 (166) | 0.42 (0.36, 0.50)* | 0.53 (0.44, 0.63)* |
| Formal | 30.8 (83) | 0.84 (0.70, 0.99)* | 0.79 (0.66, 0.94)* |

| | | | |
|---|---|---|---|
| **IMD (quintiles)^** | | | |
| *Most deprived* | | | |
| Parent | 24.1 (974) | | |
| Informal | 14.3 (54) | 0.60 (0.44, 0.80)* | 0.72 (0.53, 0.97)* |
| Formal | 16.9 (8) | 0.70 (0.34, 1.43) | 0.63 (0.28, 1.39) |
| *4* | | | |
| Parent | 29.2 (698) | | |
| Informal | 14.4 (32) | 0.49 (0.34, 0.72)* | 0.54 (0.36, 0.81)* |
| Formal | 35.9 (19) | 1.23 (0.83, 1.83) | 1.12 (0.73, 1.72) |
| *3* | | | |
| Parent | 35.0 (651) | | |
| Informal | 14.0 (20) | 0.40 (0.25, 0.63)* | 0.51 (0.33, 0.80)* |
| Formal | 40.4 (18) | 1.15 (0.78, 1.70) | 1.27 (0.86, 1.85) |
| *2* | | | |
| Parent | 45.5 (621) | | |
| Informal | 14.0 (11) | 0.31 (0.17, 0.54)* | 0.37 (0.21, 0.65)* |
| Formal | 33.5 (16) | 0.74 (0.49, 1.10) | 0.71 (0.47, 1.06) |
| *Least deprived* | | | |
| Parent | 46.9 (610) | | |
| Informal | 18.5 (9) | 0.39 (0.22, 0.71)* | 0.48 (0.26, 0.88)* |
| Formal | 29.8 (14) | 0.64 (0.41, 0.99)* | 0.64 (0.42, 1.00) |

*p<0.05; ^England only; **adjusting for mother's ethnicity, parity and age at first live birth and whether the mother returned to work before the infant was age 4 months. Missing: breastfeeding-24, childcare-185, ethnicity- 48, parity- 635, maternal age at first live birth- 653, NS-SEC 245, maternal education- 66, area deprivation- 2.

## Sensitivity analyses

Excluding children who were looked after in more than one type of childcare

Infants were classified according to the main non-parental childcare. Around one third of mothers used more one than one type of childcare between birth and 9 months. It is therefore possible that some infants were looked after in more than one type of childcare before the age of four months. The analyses were repeated excluding children who were looked after in more than one type of childcare between the birth and 9 months (since age at which subsidiary childcare started was not reported). Infants who were classified as being looked after only by a parent because their main childcare type commenced after they turned four months but who had also been looked after in other types of childcare were also excluded, in case subsidiary childcare started before the age of four months. The results from this sensitivity analysis are provided in Appendix 7 (Table 7A1) and show very similar patterns to those seen in this chapter, although sometimes with a loss of statistical power.

Exploring childcare in relation to breastfeeding initiation (as opposed to duration)

It is possible that the association between childcare and breastfeeding for at least four months is not explained by childcare use alone, but a continuum of decisions made by mothers during pregnancy regarding breastfeeding, returning to employment, and childcare use. If this is the case then one could argue that mothers who use childcare would also be less likely to initiate breastfeeding. The analyses presented here were therefore repeated, instead exploring childcare use in relation to breastfeeding initiation. The results are provided in Appendix 7 (Table 7A2). Informal childcare carried a reduced likelihood of breastfeeding initiation (aRR=0.87 [0.82, 0.91]); and although it was statistically significant and remained for most groups when stratifying by SECs, it was less pronounced than seen for breastfeeding for at least four months. In contrast to the results presented here, mothers using formal childcare were more likely to initiate breastfeeding in the overall analysis, although this was no longer significant after adjusting for confounders. However in the stratified analyses, the associations tended to be less pronounced than seen for breastfeeding for at least four months, for example the lone mothers were 33% more likely to initiate breastfeeding if they used formal childcare compared to those who did not use childcare (aRR=1.33 [1.07, 1.66]). On the other hand those with no educational qualifications were more likely to initiate breastfeeding if they used formal childcare (aRR=1.75 [1.21, 2.54]), which was not significant in the main analysis exploring breastfeeding duration (aRR=2.20 [0.94, 5.14]). These results indicate that the associations observed between childcare use and breastfeeding in the main analysis may be in part due to prenatal decisions, although not entirely.

Are differential associations by SECs explained by differing durations of childcare use?

In the overall analyses (Table 7.5), infants looked after in formal childcare were only less likely to be breastfed if they were cared for in full-time childcare. Those from more advantaged groups were more likely to use full-time childcare and this may explain why the reduced likelihood of breastfeeding in formal childcare was only experienced by the advantaged groups in the stratified analyses. In order to explore this, the results were repeated stratifying by time spent in childcare, for each stratum of SECs (Appendix 7, Table 7A3). There was a reduction of power, particularly for less advantaged groups using full-time care; however in general, the lower likelihood in informal childcare was seen in all SECs and for part-time and full-time care. The lower likelihood in formal childcare observed previously in more advantaged groups remained when stratifying by

time spent in childcare, although in some cases was only seen for full-time formal childcare.

Looking at any exposure to childcare (as opposed to childcare lasting more than 10 hours a week)

The ten hour cut off was selected as it was thought that shorter durations of childcare would be unlikely to affect feeding patterns. However the analysis was repeated as a sensitivity analysis, to explore the association between any amount of childcare on breastfeeding. As seen in Appendix 7 (Table 7A4), the patterns remained the same as those presented here, although the size of the RRs were reduced slightly, as would be expected.

## 7.5 Discussion

### *7.5.1 Summary of findings*

Compared to those cared for only by a parent (or in childcare for less than 10 hours a week), infants were half as likely to be partially or fully breastfed for at least four months if they were cared for in informal childcare before the age of four months. When exploring time spent in childcare, the likelihood of breastfeeding appeared to be slightly lower for those looked after in full-time informal childcare compared to part-time. Infants who were cared for in formal childcare were also less likely to be breastfed overall (although only after adjustment for confounders), or if the care was full-time. The findings imply that, whilst informal childcare has a detrimental effect on breastfeeding in all social groups, only mothers from the highest socio-economic groups were less likely to breastfeed if they used formal childcare. In contrast some less advantaged groups (such as lone parents) appear to be more likely to breastfeed if they use formal childcare. In the majority of cases, adjustment for confounders did not substantially change the results.

### *7.5.2 Strengths and limitations*

Strengths and limitations of the analysis are now discussed; more general issues related to the Millennium Cohort Study and the injury and childcare measures are discussed in Chapters 3 and 4. This chapter has investigated the association between childcare and breastfeeding, in a contemporary setting, and adjusting for a range of potential confounding factors. To my knowledge this is the first study to explore the association in the UK (for all mothers), and in different socio-economic groups. Despite the

relatively small sample sizes in the stratified analyses, it was possible to detect significant associations in different strata.

It was only possible to take into account the main type of childcare used before the age of four months. The analyses were repeated excluding those infants who were cared for in more than one type of childcare between birth and 9 months (since it was not possible to identify the age at which additional childcare arrangements began) and although the power was reduced the size and direction of the associations remained similar. Time spent in childcare was based on the average between birth and 9 months, and therefore may not be accurate for the period before four months. However when the analyses were repeated for any amount of childcare, the patterns were similar. Maternal recall of breastfeeding has been deemed to be accurate, particularly for any amount of breastfeeding (as opposed to exclusive breastfeeding) and over shorter periods of time (defined as 3 years or less)[214]. However, little is known about the patterning of breastfeeding recall by socio-economic status. If the recall of breastfeeding varies by socio-economic status or by childcare type, or if there is report bias according to these same characteristics, then it is possible that the results reported here are biased.

As discussed in Chapter 5, childcare use is not random. Data presented in Chapter 3 show that childcare use is socially distributed, particularly in early infancy. It is therefore possible that the patterns observed are due to residual confounding. This is discussed further in Chapter 11. The reduced likelihood of breastfeeding in more advantaged groups using formal childcare did not appear to be explained by these groups being more likely to use full-time care (Appendix 7, Table 7A3). It was not possible to explore the quality of formal childcare, or the characteristics of informal carers.

Adjusting for maternal employment did not change the association between childcare and breastfeeding, implying that childcare may influence the likelihood of breastfeeding over and above the effect of entering paid employment. However, childcare commencing before the age of four months did not necessarily precede the cessation of breastfeeding before the age of four months, and some mothers did not initiate breastfeeding at all. It is likely that, for many mothers, it is not childcare use in isolation that influences the decision to breastfeed, but a chain of antenatal decisions about infant feeding, childcare and employment. In an attempt to address this, the association

between childcare and breastfeeding initiation was explored. Whilst some of the patterns seen for breastfeeding duration remained, they were less pronounced. This would imply that the patterns observed in this chapter are not entirely explained by intentions to breastfeed. Future qualitative studies should explore why mothers from different backgrounds are more or less likely to breastfeed, taking into account childcare use.

The analyses presented in this chapter have been conducted in the most recent of the British cohorts. Despite this, the context is likely to have changed. In 2001-03, when the MCS cohort members were infants, mothers were entitled to 18 weeks statutory maternity leave and were recommended to breastfeed for at least four months. Maternity leave has since risen to six months[17]and then again to nine months (with the right to take an additional three months unpaid)[204], and whilst the proportion of infants cared for in childcare for four months may have fallen as a consequence, the recommended period of breastfeeding has also been extended to six months.

### *7.5.3 Comparison with other findings*

The majority of studies exploring the association between childcare and breastfeeding did not differentiate between informal and formal childcare. One study, of a nationally representative sample of 2515 mothers in the US in 2002, found that infants were less likely to be breastfed for six months and 12 months if they were looked after in "daycare" (no definition provided), adjusting for socio-demographic characteristics[208]. A second US study, also utilising data collected in 2002, explored the use of any childcare at age 6 months, in relation to breastfeeding initiation and duration (for at least seven days, one, three, nine and 12 months)[209]. Mothers who used non-parental care were less likely to have initiated breastfeeding. They were also less likely to partially or exclusively breastfeed at the different time points and the likelihood was lower for longer durations. However in this paper only unadjusted analyses were presented. A Danish study conducted in the 1980s using survival analysis found that childcare attendance was associated with the discontinuation of breastfeeding[210]. Lastly, a cohort of 1398 Pacific infants born in New Zealand in 2000 was explored to identify factors associated with not exclusively breastfeeding. This study also found that regular childcare use was associated with a higher likelihood of not exclusively breastfeeding, after controlling for all other associated factors[211].

A review exploring barriers and facilitators for breastfeeding in working mothers in the US identified a study which found that, in focus groups, mothers cited that supportive partners, family members and friends enabled them to continue breastfeeding. However those with negative attitudes towards breastfeeding made it difficult to continue breastfeeding. Some mothers reported individuals physically interfering with breastfeeding routines, for example through feeding the infant formula milk when the mother was at work[207]. Mothers seeking advice from their own mothers regarding breastfeeding is likely to perpetuate low breastfeeding rates in certain groups[215]. However only two studies have differentiated between different types of childcare when exploring its relationship with breastfeeding, and both confirmed the importance of separating out different types of childcare.

Kim and Peterson explored the association in 8000 infants in the US [212]. They found that those who were cared for only by a parent were most likely to be breastfed for four months, whilst infants who were cared for by a relative were the least likely to be breastfed, followed by other informal carers and then formal childcare. Rates of initiation were lower for infants who were cared for in childcare full-time than those who were cared for part-time, and the likelihood of breastfeeding was greater the later the child entered childcare. A study using MCS data, conducted by Hawkins and colleagues, aimed to investigate the impact of employment status (full-time, part-time or self-employed) and work characteristics (such as flexible working hours and maternity leave) on breastfeeding for at least four months[63]. Childcare (defined as informal and formal) used by mothers in paid employment was explored as a potential determinant of breastfeeding. Mothers reporting the use of informal childcare between birth and 9 months were less likely to breastfeed, both before and after adjustment. In contrast mothers who reported using formal childcare were more likely to breastfeed, although this was removed after controlling for confounders since more advantaged families were more likely to use formal childcare.

### *7.5.4 Implications for research, policy and practice*

The proportion of infants in informal and formal childcare before the age of 4 months was low (9%). However, this may increase given the upward trend in maternal employment. The lower likelihood of being breastfed experienced by infants cared for by family, friends and neighbours was evident in all socio-economic groups. Therefore breastfeeding campaigns in the UK might be aimed at all members of society, as well as

targeting disadvantaged current and future mothers. The majority of informal carers in the UK are grandparents, who offer flexible and affordable childcare that many parents view as the best alternative to parental care. A recent study of 215 mothers of one year old infants asked where they obtained information and advice about infant feeding and grandparents were the second most commonly cited source (53%)[216]. However there is research to suggest that negative views about breastfeeding can be passed on from generation to generation, therefore perpetuating current inequalities. Information and advice about supporting mothers to breastfeed could be offered to grandparents, specifically through channels such as the recently launched UK website for grandparents www.BeGrand.net. The move by the UK government to provide grandparents with National Insurance credits for caring for grandchildren may also provide a vehicle for health promotion.

The ideal laid out in the childcare strategy is that infants spend their first 12 months being cared for in one-to-one care (with mothers having a genuine choice to be the main carer); following which children are gradually introduced into subsidized, high quality childcare[17]. However in reality, many mothers return to paid employment before their child reaches the age of 12 months or they use childcare for other reasons. According to the Infant Feeding Survey, in 2005 45% of mothers returned to work before their baby was aged 12 months[28]. Currently there are no official regulations for infant feeding in childcare in the UK. There is no Ofsted assessment of infant feeding, and a recent report documenting best practice on how registered childcare providers are helping children to stay safe and be healthy made no mention of breastfeeding[141]. The Caroline Walker Trust published evidence-based practical and nutritional guidelines for healthy diets in childcare in 1998 (and updated them in 2006). The guidance recommended that carers support mothers to breastfeed through encouraging them to bring expressed breast milk, or to breastfeed at the childcare centre through the provision of warm and private facilities[217]. The guidance also highlighted where carers could direct mothers for advice on expressing and storing milk, or to find support groups. In 2008, a set of NICE guidance for maternal and child nutrition was published. This laid out a number of guidelines to encourage and support breastfeeding, including advice for professionals working in the childcare sector[218]. However these guidelines, and those from the Caroline Walker Trust, do not target informal carers, such as grandparents, friends and other relatives.

In this chapter, formal childcare was associated with a lower likelihood of breastfeeding in more advantaged groups and couple families, but with a higher likelihood of breastfeeding in lone parents. It has been postulated that lone parents lack confidence and can become isolated from their local communities. A focus group conducted by the Audit Commission found that lone parents do not tend to use non-essential health services unless encouraged to do so by trusted health professionals[1]. Therefore formal childcare may offer support and information to groups who are traditionally less likely to breastfeed and less likely to use health promotion services. However it is also possible that the lone mothers who used childcare in the MCS were different from those who did not and that this explains differences in breastfeeding. Further research and qualitative studies in this area are required.

Childcare centres offer a potential setting to promote breastfeeding, for example through offering storage of expressed milk and encouraging mothers to continue to breastfeed. Greater support during pregnancy and after birth may help mothers when making decisions about infant feeding, employment and childcare, enabling them to consider all possible options (such as the potential to use expressed breast milk). Qualitative research into how different types of childcare act to facilitate or discourage breastfeeding for mothers from different socio-economic groups may help to target policy and practice more effectively.

## 7.6 Summary of findings

- According to data from the IFS, the proportion of women who initiated breastfeeding increased from 62% to 76% between 1990 and 2005. However, in 2005 only 34% breastfed for at least four months. Similarly, in the MCS 33% of mothers breastfed for at least four months and mothers from more advantaged backgrounds were more likely to breastfeed.
- Mothers were less likely to breastfeed (any amount) for at least four months if they used informal or formal childcare before their infant turned four months, compared to those whose infant was cared for only by a parent.
- When considering time spent in childcare, mothers were less likely to breastfeed if they used part-time or full-time informal childcare, whereas for formal childcare, the reduced likelihood of breastfeeding was seen only if it was full-time.

- The reduced likelihood of breastfeeding in informal childcare was seen across all socio-economic groups, whereas for formal childcare the detrimental impact was seen only in the more advantaged groups. Lone parents appeared to be more likely to breastfeed if they used formal childcare compared to lone parents who did not use childcare.

The following chapter explores the last link in the childcare case study: childcare and overweight.

# 8 Chapter 8 – Childcare use and inequalities in overweight

In Chapter 2 the association between childcare and overweight was selected as one of the links to be explored in Phase 2 for the childcare case study. Chapter 3 described trends and inequalities in any amount of childcare. In this chapter trends and inequalities in overweight and also in childcare between the age of 9 months and 3 years lasting at least 10 hours a week are presented. The association between these measures of childcare use and overweight are then explored, overall and in different socio-economic groups. This is the final link explored in the childcare case study.

Some of the results from this chapter have been published previously in the following paper: Pearce et al. "Is childcare associated with the risk of overweight and obesity in the early years? Findings from the UK Millennium Cohort Study". *International Journal of Obesity*. 2010. 34: 1160-1168. (Appendix 1).

## 8.1 Objectives

- To establish trends and inequalities in overweight and obesity (8.2)
- To establish trends and inequalities in childcare between the age of 9 months and 3 years lasting at least 10 hours a week (8.3)
- To explore the association between childcare use between the age of 9 months and 3 years and overweight (including obesity) at age 3, and whether it differed by SECs, using data from the Millennium Cohort Study (8.4)

## 8.2 Overweight (including obesity) in the preschool years: trends and inequalities

### *8.2.1 Background*

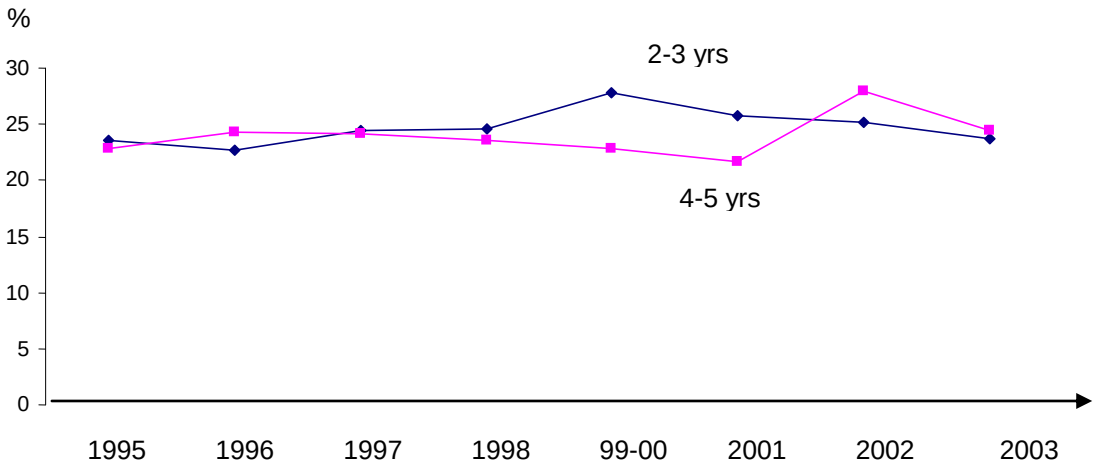
The prevalence of childhood overweight and obesity has increased considerably in recent decades, in the UK and other resource-rich countries[219;220]. Nearly one quarter of preschool children are overweight or obese[26;221-223] with higher rates observed in those living with a lone parent[25] or in more deprived areas[222;224]. A recent review of overweight and obesity in infants and preschool children highlighted an urgent need for research and policies on the prevention and treatment of overweight and obesity in this age group[225]. The growing recognition that childhood obesity is a major public health

problem in the UK resulted in a cross-Government strategy for England "Healthy Weight, Healthy Lives" in 2008[199] and a national Public Service Agreement (PSA) to reduce the proportion of children and young people (aged 2-15 years) who are overweight or obese to 2000 levels by 2020[200]. For young children, this strategy aimed to increase breastfeeding through the Healthy Child Programme and promote physical activity and healthy diets in childcare through the Early Years Foundation. Progress towards the PSA target was originally monitored using the Health Survey for England, and more recently the National Child Measurement Programme (as data quality has improved) which measures children when they are aged four-five and 10-11 years old.

### *8.2.2 Trends in overweight and obesity*

Figure 8.1 shows recent trends in overweight or obesity (using International Obesity Task Force (IOTF) cut-offs) in two-three year olds and four-five year olds, using data from the Health Survey for England (HSE) between 1995 and 2003. Whilst rates in these young age groups have not increased in recent years, they remain high, with around one quarter of children being overweight or obese by the time they start primary school. This is in agreement with data from the National Child Measurement Programme (NCMP) on levels of overweight and obesity (using 1990 British growth references[226]) in Reception year children (aged four-five years) which indicate that in 2008/9 23% of children were overweight or obese (with a response rate of 90%)[227].

*Figure 8.1: Proportion of 2-3 year olds and 4-5 year olds who were overweight or obese 1995-2003, Health Survey for England*




| Baseline (unweighted N) | 1995 | 1996 | 1997 | 1998 | '99-00 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|---|---|---|
| 2-3 years | 456 | 480 | 884 | 463 | 428 | 352 | 716 | 287 |
| 4-5 years | 544 | 560 | 990 | 516 | 504 | 448 | 874 | 381 |

### *8.2.3 Prevalence and inequalities in overweight and obesity, in the MCS*

In the MCS, 23% of the children were overweight or obese when they were 3 years old, as shown in Table 8.1. Rates of overweight and obesity in the MCS limited to children living England were 22.5%[228], similar to levels observed in the HSE at a similar time (2003) (Figure 8.1).

*Table 8.1: Overweight (including obesity) at age 3 years in the MCS: Weighted % (N)*

| **Weight Status** | **Weighted % (N)** |
|---|---|
| Normal | 77.0 (10088) |
| Overweight | 18.0 (2407) |
| Obese | 5.1 (692) |

Missing: 1247

Table 8.2 shows the proportion of children who were overweight or obese in the MCS, at 3 years, by SECs (captured at 9 months for NS-SEC and maternal education, and 3 years for lone parenthood and area deprivation). Children from poorer backgrounds were more likely to be overweight or obese, although the relative and absolute differences were only statistically significant for certain groups. Children of lone parents were more likely to be overweight or obese compared to those living in couple families (relative difference (RD)=1.11 [95% CI: 1.00, 1.23]; absolute difference (AD)=2.54% [-0.01, 5.10]), and those children whose mother's highest qualifications were GCSE D-G were also more likely to be overweight compared to those whose mothers had a degree (RD=1.18 [1.02, 1.37]); AD=3.92% [0.32, 7.53]). Children living in the first and second most deprived areas were more likely to be overweight than those living in the least deprived areas when looking at relative and absolute differences.

*Table 8.2: Overweight (including obesity) at age 3 years in the MCS according to SECs: weighted % (N), and absolute and relative differences (95% CIs), with the most advantaged SECs group as baseline*

| | **% (N) overweight** | **Relative difference** | **Absolute difference** |
|---|---|---|---|
| *NS-SEC* | | | |
| Managerial | 23.1 (893) | - | - |
| Intermediate | 20.9 (594) | 0.90 (0.81, 1.01) | 1.00 (-1.11, 3.11) |
| Routine | 24.1(1318) | 1.04 (0.95, 1.14) | -2.25 (-4.70, 0.19) |
| *Education* | | | |
| Degree | 21.9 (517) | - | - |
| Diploma | 22.8 (286) | 1.05 (0.90, 1.22) | 0.99 (-2.44, 4.43) |
| A Level | 20.5 (269) | 0.94 (0.81, 1.09) | -1.37 (-4.50, 1.76) |
| GCSE A-C | 23.0 (1079) | 1.05 (0.94, 1.17) | 1.14 (-1.27, 3.55) |
| GCSE D-G | 25.8 (344) | 1.18 (1.02, 1.37)* | 3.92 (0.32, 7.53)* |
| No qualifications | 24.6 (532) | 1.12 (0.98, 1.29) | 2.72 (-0.40, 5.85) |
| *Lone parenthood* | | | |
| Couple families | 22.6 (2565) | - | - |
| Lone parents | 25.2 (534) | 1.11 (1.00, 1.23)* | 2.54 (-0.01, 5.10) |
| *IMD (quintiles)*^ | | | |
| Least deprived | 20.2 (274) | - | - |
| 4 | 20.7 (258) | 1.02 (0.88, 1.20) | 0.50 (-2.69, 3.68) |
| 3 | 22.4 (339) | 1.11 (0.96, 1.29) | 2.20 (-0.95, 5.35) |
| 2 | 24.7 (410) | 1.22 (1.06, 1.41)* | 4.49 (1.34, 7.64)* |
| Most deprived | 24.1 (558) | 1.19 (1.04, 1.36)* | 3.87 (0.96, 6.77)* |

*P<=0.05. ^England only. Missing: NS-SEC 176, maternal education 31, area deprivation 53.

## 8.3 Childcare 9 month to 3 years and lasting at least 10 hours a week: trends and inequalities

### *8.3.1 Background*

In this chapter childcare use lasting at least 10 hours a week (on average) is explored in relation to overweight, since it is less likely that shorter durations of childcare would have an impact upon physical activity levels and diet.

As discussed earlier in Chapter 4, children aged three-four years and those aged two living in deprived areas are entitled to 12.5 hours of free early year's education under the 2004 childcare strategy, and this increased to 15 hours in September 2010[17]. The number of children attending childcare for at least 10 hours a week is likely to be influenced by this free entitlement specifically, in addition to other childcare policies which aim to increase uptake more generally (such as the childcare tax credits).

### *8.3.2 Trends in childcare*

Whilst there are limited data on childcare intensity over time in the UK, it is likely that childcare use lasting at least 10 hours a week has increased in recent years due to the introduction of the free entitlement of early years education. Data indicate that uptake of these places increased between 2001 and 2005[140], and then leveled out at around 97%[229].

### *8.3.3 Prevalence and inequalities in childcare, in the MCS*

Between the age of 9 months and 3 years 24% of children were cared for in informal childcare for at least 10 hours a week and 22% were cared for in formal childcare (Table 8.3). This is compared to respective prevalences of 31% and 28% for any amount of childcare between 9 months and 3 years (presented in Chapter 4).

*Table 8.3: Childcare lasting at least 10 hours a week between 9 months and 3 years in the MCS: Weighted % N)*

| **Main childcare 9mths-3 yrs** | **Weighted % (N)** |
|---|---|
| Parent only | 54.7 (7,394) |
| Informal | 23.5 (3,468) |
| Formal | 21.8 (2,889) |

Missing: 926

The socio-economic patterning of childcare use for at least 10 hours a week between 9 months and 3 years (Table 8.4) was similar to that observed for any amount of childcare between 9 months and 3 years (Chapter 4), with those from less advantaged backgrounds being more likely to use parental care only, and less likely to use formal childcare, than those from more advantaged backgrounds. For example, children whose mothers had no educational qualifications were more than twice as likely to be looked after only by a parent (RD=2.10 [1.95, 2.26]) than those whose mothers had a degree, and the absolute difference between the two groups was 40.33% (35.73, 43.92). Children living in the most deprived areas in England were less than half as likely to be cared for in formal childcare compared to those living in the least deprived areas (RD=0.43 [0.38, 0.49]), with a AD of -18.31% (-21.24, -15.37). Social patterns in informal childcare use (for at least 10 hours a week) were less consistent; the least advantaged SECs tended to be less likely to use informal childcare than those from the more advantaged SECs, whilst the intermediate groups were more likely to use informal childcare. For example children whose mothers had no educational qualifications were

less likely to be looked after in informal childcare than those whose mothers had a degree (RD=0.69 [0.57, 0.83]; AD=-5.82% [-8.58, -3.07), whilst those whose mothers had achieved a diploma, A Levels or GCSE were more likely to be looked after in informal childcare, in terms of relative and absolute differences.

*Table 8.4: Childcare (lasting at least 10 hours a week) between 9 months and 3 years in the MCS, according to SECs: weighted % (N), and relative and absolute differences (95% CIs), with the most advantaged groups as the baseline*

| **Childcare type** | **Parent** | | | **Informal** | | | **Formal** | | | **Total %** |
|---|---|---|---|---|---|---|---|---|---|---|
| **SECs** | *% (N)* | *Relative difference (95%* | *Absolute difference (95% CI)* | *% (N)* | *Relative difference (95%* | *Absolute difference (95% CI)* | *% (N)* | *Relative difference (95%* | *Absolute difference (95% CI)* | |
| *NS-SEC* | | | | | | | | | | |
| Managerial | 36.9 (1315) | - | - | 24.0 (1052) | - | - | 39.1 (1449) | - | - | 100 |
| Intermediate | 50.6 (1351) | 1.37 (1.28, 1.46)* | 13.69 (10.82, 16.56)* | 27.9 (889) | 1.16 (1.05, 1.29)* | 3.89 (1.20, 6.58)* | 21.5 (596) | 0.55 (0.50, 0.61)* | -17.58 (-20.18, -14.99)* | 100 |
| Routine | 67.7 (3642) | 1.83 (1.74, 1.93)* | 30.71 (28.46, 32.97)* | 21.4 (1218) | 0.89 (0.80, 0.99)* | -2.65 (-5.01, -0.29)* | 11.0 (612) | 0.28 (0.25, 0.31)* | -28.06 (-30.15, -25.98)* | 100 |
| *Education* | | | | | | | | | | |
| Degree | 36.8 (791) | - | - | 18.7 (515) | - | - | 44.6 (958) | - | - | 100 |
| Diploma | 46.5 (521) | 1.26 (1.16, 1.38)* | 9.68 (5.98, 13.39)* | 26.9 (392) | 1.44 (1.25, 1.66)* | 8.24 (5.06, 11.41)* | 26.6 (330) | 0.60 (0.54, 0.66)* | -17.92 (-21.19, -14.65)* | 100 |
| A Level | 47.9 (610) | 1.30 (1.20, 1.41)* | 11.12 (7.64, 14.60)* | 25.4 (387) | 1.36 (1.19, 1.56)* | 6.77 (3.75, 9.78)* | 26.7 (328) | 0.60 (0.54, 0.67)* | -17.89 (-21.23, -14.55)* | 100 |
| GCSE A-C | 56.3 (2500) | 1.53 (1.43, 1.64)* | 19.54 (16.72, 22.37)* | 26.8 (1298) | 1.43 (1.27, 1.62)* | 8.09 (5.57, 10.60)* | 16.9 (758) | 0.38 (0.34, 0.42)* | -27.63 (-30.18, -25.07)* | 100 |
| GCSE D-G | 64.4 (924) | 1.75 (1.62, 1.89)* | 27.65 (23.96, 31.34)* | 23.7 (321) | 1.27 (1.09, 1.48)* | 5.04 (1.79, 8.30)* | 11.9 (171) | 0.27 (0.23, 0.31)* | -32.69 (-35.48, -29.91)* | 100 |
| No qualifications | 77.1 (1,792) | 2.10 (1.95, 2.26)* | 40.33 (36.73, 43.92)* | 12.8 (307) | 0.69 (0.57, 0.83)* | -5.82 (-8.58, -3.07)* | 10.1 (236) | 0.23 (0.19, 0.27)* | -34.50 (-37.36, -31.65)* | 100 |
| *Lone parenthood* | | | | | | | | | | |
| Couple families | 55.2 (6151) | - | - | 23.9 (280) | - | - | 22.0 (2379) | - | - | 100 |
| Lone parents | 58.1 (1243) | 1.05 (1.00, 1.11)* | 2.93 (0.13, 5.74)* | 21.6 (474) | 0.90 (0.80, 1.02) | -2.19 (-4.64, 0.26) | 21.2 (461) | 0.97 (0.87, 1.07) | -0.74 (-2.91, 1.43) | 100 |
| *IMD (quintiles)^* | | | | | | | | | | |
| Least deprived | 50.7 (675) | - | - | 17.0 (233) | - | - | 32.2 (444) | - | - | 100 |
| 4 | 50.2 (640) | 0.99 (0.92, 1.07) | -0.53 (-4.46, 3.40) | 22.5 (289) | 1.32 (1.12, 1.55)* | 5.44 (2.32, 8.56)* | 27.3 (356) | 0.85 (0.75, 0.96)* | -4.91 (-8.47, -1.35)* | 100 |
| 3 | 55.2 (821) | 1.09 (1.01, 1.17)* | 4.50 (0.68, 8.32)* | 24.1 (383) | 1.41 (1.21, 1.65)* | 7.05 (4.00, 10.11)* | 20.7 (324) | 0.64 (0.56, 0.73)* | -11.56 (-14.89, -8.22)* | 100 |
| 2 | 57.3 (987) | 1.13 (1.05, 1.21)* | 6.54 (2.81, 10.26)* | 25.3 (447) | 1.49 (1.28, 1.72)* | 8.26 (5.25, 11.28)* | 17.4 (325) | 0.54 (0.47, 0.62)* | -14.80 (-17.99, -11.61)* | 100 |
| Most deprived | 70.3 (1789) | 1.38 (1.30, 1.47)* | 19.53 (16.15, 22.90)* | 15.8 (383) | 0.93 (0.79, 1.09) | -1.22 (-3.81, 1.37) | 13.9 (375) | 0.43 (0.38, 0.49)* | -18.31 (-21.24, -15.37)* | 100 |

P<=0.05. ^ England only. Missing: Childcare 963, NS-SEC 176, maternal education 31, area deprivation 53.

## 8.4 Exploring the association between childcare and overweight between the age of 9 months and 3 years

### *8.4.1 Background*

Due to the increasing proportions of young children being looked after in non-parental care, childcare offers a potential setting for obesity prevention[230;231]. Childcare is likely to influence weight status through affecting infant feeding (such as the propensity to breastfeed) and the diets and physical activity levels of toddlers.

Whilst there is clear nutritional guidance for infants and school aged children, there is a lack of consistent and clear nutritional guidelines for preschool children[232]. In 2008 food based and nutrient standards were introduced by the School Food Trust, which was established by the Department for Education and Skills in 2005, with which schools must comply. Standards exist for school caterers providing lunches for nursery schools[233], and an Ofsted survey of eating in 46 registered childcare centres and 64 registered childcare centres in West Yorkshire in 2006 found that the majority of childcare providers were rated satisfactory or better[234]. However these standards only apply to state-maintained nurseries and are far less stringent than the standards set for primary and secondary schools[235]. Furthermore there are no requirements for training in nutrition or food quality for childcare workers, and no agency is responsible for monitoring the quality of food provided in childcare settings[235] (Ofsted inspections include an assessment of "food and drink" although no attention appears to be paid to nutritional content).

The Caroline Walker Trust published detailed practical guidelines for the under-fives in 1998 and these were updated in 2006 to provide more comprehensive nutrition based standards [217]. However a voluntary survey of nutritional standards of 118 nursery schools across 29 councils in 2009 found that most nurseries were not aware of the Caroline Walker Trust guidelines[236], although some had produced their own food and nutrition policies. The majority of nurseries in the survey were failing to meet the criteria laid out in the Caroline Walker Trust guidance. On a more positive note, the report highlighted that these issues were not due to a lack of interest, but rather because of a lack of targeted, accessible and practical guidance[236]. The National Institute for Health and Clinical Excellence (NICE) guidance highlights the role of childcare and preschool settings in improving maternal and child nutrition, and recommendations include the provision of healthy snacks[218].

The US National Association for Sport and Physical Education (NASPE) recommends that preschoolers should spend at least 60 minutes a day in structured physical activity, at least 60 minutes a day in unstructured physical activity, and no more than 60 minutes of sedentary activity (excluding sleeping)[237]. A review of objectively measured physical activity and sedentary behaviours in three-six year olds in childcare settings identified 12 studies, the majority from the US[238]. The author concluded that levels of physical activity were low and that sedentary behaviours were high (measured against the NAPSE guidelines).

In 2004 the Chief Medical Officer (CMO) for England issued guidance that children and young people be physically active for at least 60 minutes each day[239] The British Heart Foundation also recommends that children aged five to 18 years are active for 60 minutes each day. Equivalent guidelines for physical activity in the under fives do not exist in the UK, although recommendations for the promotion of physical activity in preschool do exist. For example NICE guidance for the promotion of activity in preschool and school-aged children was issued in 2009, targeting families, preschool settings, schools and communities[240]. Recommendations refer to the provision of space, facilities and equipment, school (and preschool) travel plans, and tailoring activities according to age of the child. Also in 2009, a report laying out guidelines for tackling obesity through the child health programme made recommendations for childcare centres and preschool (such as provision of outdoor play and ensuring that active play is proportionate to time spent in the childcare setting)[241]. The Caroline Walker Trust also made brief recommendations for physical activity in childcare settings, alongside the nutritional guidelines.

There is little research investigating the association between childcare and overweight[242;243], particularly in the UK. Three US based studies investigating a range of childcare types found that children cared for in informal childcare were at an increased risk of overweight in childhood[244;245] or weight gain in infancy[212]. Two of these studies explored time spent in childcare and whilst one found that the risk of overweight increased with every 10 hours of informal childcare[245], the other found that only part-time (<35 hours a week) childcare (informal and formal combined) was associated with greater weight gain in infancy[212]. On the basis of these findings the authors hypothesised that the increased risk observed in informal childcare may be explained by grandparents being less likely to restrict children's access to television or

energy dense foods[244], or the reduced likelihood of carers related to the child to follow parents' feeding requests[212], particularly if the care takes place outside the parents' home[245]. However 2 other studies set in Japan, and both using the same cohort, found no association between childcare (informal or formal) and obesity[246;247], whilst another US based study found that shorter periods of formal childcare (<15 hours a week) had a protective influence when compared to children looked after by a parent or informal carers[248]. Two studies explored measures of affluence as potential effect modifiers of the relationship between childcare and overweight, with inconclusive results[244;248]. Breastfeeding has also been considered as a potential mediator between childcare use and weight status; one cross-sectional study found that it did not influence the association[212] whilst another found that it mediated the association a small amount[245].

In this chapter the association between childcare use between the age of 9 months and 3 years and overweight status at age 3 is explored, overall and according to socio-economic circumstances (SECs). As with the other childcare analyses in chapters 6 and 7, formal and informal childcare are explored separately. For some analyses grandparents are also separated out from other informal carers, due to assertions that care by grandparents might explain elevated risks in informal childcare. Since childcare use was found to be associated with breastfeeding in Chapter 7, infant feeding is also explored as a potential mediator between childcare and overweight.

### *8.4.2 Methods*

**Participants**

The analyses in this chapter include children who took part in the first and second sweeps, giving a sample size of 14,434. Of these, 12,354 (86%) had complete childcare and height/weight data (8.6% were missing height and weight data and 6.4% were missing childcare information).

**Measurements**

Explanatory measures: childcare

For the main analyses in this chapter, non-parental childcare type used between the age of 9 months and 3 years is explored. Informal and formal childcare which lasted for less than 10 hours a week on average was re-classified as being cared for only by a parent, since these shorter periods of childcare would be unlikely to impact on diet and physical

activity to a degree that would influence weight status[244]. For some analyses childcare was also divided into part-time (10-30 hours a week, on average) and full-time (31 hours or more), and grandparent care was separated out from other informal childcare types. Appendix 2.4 describes the childcare variables in greater depth.

Childcare taking place between birth and 4 months is also used in the analysis which considers breastfeeding as a mediator between childcare and overweight. This variable is described in Chapter 7.

Outcome measures: overweight (including obesity)

Children were classified as being overweight or obese using the IOTF cut-offs for body mass index (BMI) (described in greater detail in Chapter 2, section 2.5.2).

Infant feeding

Breastfeeding and the introduction of solids were explored as measures of infant feeding. Infants were classified as having never been breastfed, breastfed for less than four calendar months (<17.4 weeks), or breastfed for four calendar months or more (>=17.4 weeks), since at the time of the MCS births this was the duration recommended by the World Health Organisation[96] (see Chapter 7). The age at which the mother introduced solids was also explored, using the same four month cut-off, based on UK government recommendations at that time[97].

Socio-economic circumstances

The four measures of socio-economic circumstances (SECs) outlined in Chapter 2 were used for this analysis: NS-SEC, maternal education, lone parenthood and area deprivation. Measures for lone parenthood and area deprivation captured at the second sweep were used, whereas measures of NS-SEC and maternal education were taken from the first sweep, because they were less likely to have changed.

Confounders

In addition to the characteristics controlled for in all analyses throughout this thesis (number of children in the household, ethnicity, maternal age), potential confounders identified in previous MCS analyses that were related to overweight[25] and also related to childcare type were adjusted for: maternal pre-pregnancy overweight (P=0.0554), whether the mother smoked during pregnancy (P<0.001) and the child's birthweight z-

scores (calculated using the British 1990 growth reference, adjusted for gestational age and gender) (P=0.0056 when grouped into low [<2.5kg], normal [2.5-4.5kg] and high [>4.5kg] weight). These were all captured at the first sweep and are described in detail in the relevant paper[25].

A childcare centre-level study of television viewing in the US found that television viewing time was significantly higher in home-based childcare than centre-based care and that more highly educated childcare staff reduced screen time in home-based childcare (i.e. childminders)[249]. In the MCS, mothers reported how much time the child spent watching the television or videos per day, however it is unlikely that this measure would accurately capture screen time when in childcare because the mother would not necessarily be aware of it. Television viewing at home (which is what this variable is more likely to capture) was explored as a potential confounder between childcare use and overweight, however it did not alter the association, before or after adjustment for all other confounders (data not shown). Therefore it was not controlled for in the main analysis.

**Analysis**

Childcare and obesity at 3 years

Poisson regression was used to estimate unadjusted (RR) and adjusted risk ratios (aRR) for being overweight at age 3 years, according to whether the child was cared for in informal and formal childcare between the age of 9 months and 3 years (for at least 10 hours a week), compared to those who were cared for only by a parent (or in childcare for less than 10 hours a week). These analyses were then repeated separately for children cared for in childcare for 10-30 hours a week (part-time) and 31 hours a week or more (full-time), to examine whether the risk of obesity was different for children spending more or less time in childcare. Following this the association between childcare and overweight was explored for each stratum of SECs. Due to the increased risk of overweight observed in informal childcare in these analyses, and the hypothesis that this may be in part driven by care by grandparents[244], the analyses were repeated differentiating between grandparents and other informal carers.

Infant feeding as a mediator

In order to explore whether infant feeding mediated the association between childcare and overweight, unadjusted risk ratios were estimated for being overweight at age 3,

according to childcare use before the age of four months. The same confounding characteristics used previously were then adjusted for, along with lone parenthood, NS-SEC and maternal education (since these measures were not being stratified by for this particular analysis; area deprivation was not controlled for since the analysis would then have to be limited to England only). Following this breastfeeding duration and age at introduction of solids were added into the model one at a time, with the assumption that any changes to the risk ratios for being overweight or obese would indicate potential mediation. This was then repeated, limited to children who had been cared for in the same childcare type at age four months and 3 years (to limit the influence of subsequent childcare types). Stratified analyses were not conducted because I could not identify a plausible reason why breastfeeding would mediate the association between childcare and overweight in some groups but not others.

A number of sensitivity analyses were also conducted to take into account some of the limitations of the data.

### *8.4.3 Results*

**Childcare and obesity at age 3 years**

Table 8.5 provides the risk of overweight for children who were cared for in informal and formal childcare, compared to those cared for only by a parent. Unadjusted and adjusted risk ratios are presented overall, according to hours spent in childcare per week, and stratified by the measures of socio-economic background. Informal childcare was associated with an increased risk of overweight, and the association remained after adjusting for confounders (aRR=1.15 [1.04, 1.27]). There was no significant difference in overweight between children cared for in formal childcare and those cared for only by a parent. When stratifying by hours spent in childcare, the risk of overweight in informal childcare increased for those who were cared for full-time (aRR=1.34 [1.15, 1.57]), but was borderline-significant for part-time informal childcare (aRR=1.11 [0.99, 1.24]). There was no significant association seen for part-time or full-time formal childcare.

When stratifying by SECs, the elevated risk seen in informal childcare was observed in the most advantaged groups, before and after adjustment. Children whose mothers were from managerial & professional backgrounds (aRR=1.23 [1.02, 1.47]), were educated to the degree level or above (aRR=1.43 [1.13, 1.83]), or living as part of a

couple (aRR=1.18 [1.06, 1.32]), were more likely to be overweight if they were cared for in informal childcare, compared to children from the same socio-economic strata who were cared for only by a parent. An increased risk of overweight in informal childcare was also observed for children living in the middle quintile of area deprivation (aRR=1.37 [1.07, 1.75]). There was no significant difference in overweight between children cared for in formal childcare and those cared for only by a parent in almost all of the strata. Children whose mothers had AS/A Levels were more likely to be overweight, although this was borderline-significant after controlling for confounders (aRR=1.41 [0.99, 2.00]).

*Table 8.5: Association between childcare and overweight (including obesity) at age 3 years in the MCS: unadjusted and adjusted risk ratios (RR (95% CIs), overall and by SECs*

| | **% (N) overweight** | **Unadjusted RR (95% CI)** | **Adjusted RR [1] (95% CI)** |
|---|---|---|---|
| Overall analysis | | | |
| Parent only | 22.2 (1520) | - | - |
| Informal | 25.3 (773) | 1.14 (1.04, 1.25)* | 1.15 (1.04, 1.27)* |
| Formal | 23.2 (617) | 1.05 (0.95, 1.15) | 1.08 (0.98, 1.19) |
| Time spent in childcare | | | |
| Parent only | 22.2 (1520) | - | - |
| Informal P/T | 24.2 (598) | 1.09 (0.99, 1.21) | 1.11 (0.99, 1.24) |
| Informal F/T | 30.1 (175) | 1.36 (1.16, 1.59)* | 1.34 (1.15, 1.57)* |
| Formal P/T | 22.5 (452) | 1.01 (0.91, 1.13) | 1.07 (0.96, 1.21) |
| Formal F/T | 25.5 (165) | 1.15 (0.98, 1.35) | 1.10 (0.93, 1.30) |
| Stratified by SECs | | | |
| NS-SEC | | | |
| *Routine & Manual* | | | |
| Parent only | 23.3 (790) | - | - |
| Informal | 25.4 (289) | 1.09 (0.95, 1.26) | 1.12 (0.96, 1.29) |
| Formal | 27.2 (152) | 1.17 (0.98, 1.39) | 1.19 (0.98, 1.45) |
| *Intermediate* | | | |
| Parent only | 19.3 (242) | - | - |
| Informal | 22.6 (193) | 1.17 (0.97, 1.42) | 1.16 (0.95, 1.42) |
| Formal | 21.5 (121) | 1.11 (0.90, 1.37) | 1.10 (0.88, 1.37) |
| *Managerial & Prof* | | | |
| Parent only | 22.0 (270) | - | - |
| Informal | 27.2 (266) | 1.24 (1.04, 1.47)* | 1.22 (1.02, 1.46)* |
| Formal | 22.2 (306) | 1.01 (0.86, 1.19) | 1.05 (0.88, 1.24) |
| Education | | | |
| *No qualifications* | | | |
| Parent only | 24.6 (385) | - | |
| Informal | 27.1 (69) | 1.10 (0.85, 1.43) | 1.17 (0.90, 1.52) |
| Formal | 24.7 (55) | 1.01 (0.73, 1.39) | 1.08 (0.76, 1.53) |
| *GCSE D-G* | | | |
| Parent only | 25.8 (205) | - | |
| Informal | 27.3 (76) | 1.06 (0.82, 1.36) | 1.15 (0.89, 1.47) |

| | | | |
|---|---|---|---|
| Formal | 28.2 (41) | 1.09 (0.78, 1.54) | 0.98 (0.67, 1.44) |
| GCSE A-C | | | |
| Parent only | 21.6 (527) | - | |
| Informal | 24.6 (315) | 1.14 (0.98, 1.32) | 1.14 (0.98, 1.34) |
| Formal | 23.4 (168) | 1.08 (0.90, 1.30) | 1.13 (0.93, 1.36) |
| A/AS Levels | | | |
| Parent only | 16.8 (98) | - | |
| Informal | 22.7 (84) | 1.35 (0.98, 1.86) | 1.26 (0.92, 1.72) |
| Formal | 25.4 (71) | 1.51 (1.08, 2.12)* | 1.42 (1.00, 2.01)* |
| *Diploma* | | | |
| Parent only | 22.5 (107) | - | |
| Informal | 22.6 (87) | 1.01 (0.75, 1.36) | 0.98 (0.73, 1.32) |
| Formal | 24.7 (79) | 1.10 (0.82, 1.47) | 1.11 (0.83, 1.50) |
| *Degree* | | | |
| Parent only | 19.8 (150) | - | |
| Informal | 29.2 (133) | 1.48 (1.19, 1.84)* | 1.42 (1.11, 1.81)* |
| Formal | 20.4 (192) | 1.03 (0.82, 1.29) | 0.98 (0.77, 1.25) |
| Lone parenthood | | | |
| *Lone parent* | | | |
| Parent only | 24.6 (279) | - | - |
| Informal | 25.8 (108) | 1.05 (0.82, 1.34) | 1.02 (0.77, 1.34) |
| Formal | 26.0 (108) | 1.05 (0.85, 1.30) | 1.07 (0.84, 1.35) |
| *Couple family* | | | |
| Parent only | 21.7 (1241) | - | - |
| Informal | 25.2 (665) | 1.16 (1.05, 1.28)* | 1.18 (1.06, 1.32)* |
| Formal | 22.7 (509) | 1.05 (0.94, 1.16) | 1.08 (0.97, 1.21) |
| IMD (quintiles)^ | | | |
| *Most deprived* | | | |
| Parent only | 23.2 (349) | | - |
| Informal | 26.6 (92) | 1.15 (0.93, 1.42) | 1.19 (0.95, 1.50) |
| Formal | 23.3 (76) | 1.00 (0.79, 1.28) | 0.98 (0.75, 1.28) |
| *4* | | | |
| Parent only | 24.0 (208) | | - |
| Informal | 27.4 (106) | 1.14 (0.92, 1.42) | 1.16 (0.92, 1.46) |
| Formal | 25.6 (73) | 1.07 (0.83, 1.38) | 1.06 (0.81, 1.38) |
| *3* | | | |
| Parent only | 20.2 (147) | | - |
| Informal | 27.4 (100) | 1.35 (1.07, 1.72)* | 1.37 (1.07, 1.75)* |
| Formal | 22.9 (72) | 1.13 (0.86, 1.49) | 1.12 (0.85, 1.47) |
| *2* | | | |
| Parent only | 18.8 (112) | | - |
| Informal | 23.4 (61) | 1.25 (0.94, 1.65) | 1.15 (0.86, 1.54) |
| Formal | 21.9 (71) | 1.16 (0.89, 1.53) | 1.09 (0.83, 1.44) |
| *Least deprived* | | | |
| Parent only | 20.6 (129) | - | - |
| Informal | 19.3 (43) | 0.94 (0.69, 1.29) | 0.99 (0.71, 1.36) |
| Formal | 20.6 (85) | 1.00 (0.78, 1.28) | 1.08 (0.84, 1.40) |

*<=0.05. ^England only. [1] Adjusting for maternal age, ethnicity, number of children in household at age 3 years, pre-pregnancy maternal overweight, birth weight, smoking during pregnancy, age of child in months. Missing: BMI 1247, childcare 926, NS-SEC 176, maternal education 31, area deprivation 53, maternal age at first live birth 428, ethnicity 31, maternal pre-pregnancy overweight 886, birthweight z score 169, smoking during pregnancy 60, no children in household 51.

Table 8.6 presents the overall analysis between childcare and overweight, differentiating between care by grandparents and other informal care. The increased risk of overweight was only significant in children who were cared for by grandparents (aRR=1.18 [1.05, 1.32]) and not other informal carers (aRR=1.15 [0.97, 1.37]), although this may be due to a reduction in power in the other informal childcare group. When the analysis was stratified by time spent in childcare, both part-time (aRR=1.15 [1.01, 1.30]) and full-time (aRR=1.34 [1.12, 1.60]) care by grandparents was associated with an increased risk of overweight, and an increased risk also emerged for other informal childcare, although only if it was full-time (aRR=1.40 [1.06, 1.86]). When stratified by SECs, the increased risk remained for grandparent care for higher socio-economic groups but not always for other informal care, for example children from routine & manual backgrounds were more likely to be overweight if they were looked after by a grandparent (aRR=1.26 [1.04, 1.52]), but not if they were looked after by another informal carer (aRR=1.12 [0.81, 1.53]). However the absence of an association in other informal carers may be due to a lack of power (grandparents made up three-quarters of all informal carers).

*Table 8.6: Association between children and overweight (including obesity) at age 3 years in the MCS, separating grandparent and other informal childcare: unadjusted and adjusted risk ratios (95% CIs), overall, according to time spent in childcare, and by SECs*

| | % (N) overweight | Unadjusted RR (95% CI) | Adjusted RR [1] (95% CI) |
|---|---|---|---|
| Overall analysis | | | |
| Parent only | 22.2 (1520) | - | - |
| Grandparent | 25.4 (608) | 1.15 (1.04, 1.27)* | 1.18 (1.05, 1.32)* |
| Other informal | 24.6 (165) | 1.11 (0.94, 1.31) | 1.15 (0.97, 1.37) |
| Time spent in childcare | | | |
| Parent only | 22.2 (1520) | | |
| Grandparent P/T | 24.6 (487) | 1.12 (1.00, 1.27)* | 1.15 (1.01, 1.30)* |
| Grandparent F/T | 29.6 (121) | 1.30 (1.09, 1.54) * | 1.34 (1.12, 1.60)* |
| Other informal P/T | 22.5 (111) | 1.06 (0.86, 1.30) | 1.07 (0.87, 1.32) |
| Other informal F/T | 31.3 (54) | 1.46 (1.11, 1.92) * | 1.40 (1.06, 1.86)* |
| Stratified by SECs | | | |
| **NS-SEC** | | | |
| *Routine & Manual* | | | |
| Parent only | 23.3 (790) | | |
| Grandparent | 25.4 (223) | 1.09 (0.94, 1.27) | 1.10 (0.94, 1.28) |
| Other informal | 25.3 (56) | 1.09 (0.81, 1.47) | 1.17 (0.87, 1.57) |
| *Intermediate* | | | |
| Parent only | 19.3 (242) | | |
| Grandparent | 22.8 (148) | 1.18 (0.95, 1.47) | 1.16 (0.93, 1.46) |
| Other informal | 22.1 (45) | 1.14 (0.84, 1.55) | 1.14 (0.82, 1.60) |
| *Managerial & Prof* | | | |
| Parent only | 22.0 (270) | | |
| Grandparent | 27.9 (210) | 1.27 (1.06, 1.51)* | 1.26 (1.04, 1.52)* |
| Other informal | 24.7 (56) | 1.12 (0.81, 1.54) | 1.12 (0.81, 1.53) |
| Education | | | |
| *No qualifications* | | | |
| Parent only | 24.6 (385) | | |
| Grandparent | 29.3 (53) | 1.19 (0.90, 1.58) | 1.19 (0.88, 1.59) |
| Other informal | 21.0 (16) | 0.85 (0.48, 1.51) | 1.11 (0.62, 1.97) |
| *GCSE D-G* | | | |
| Parent only | 25.8 (205) | | |
| Grandparent | 27.3 (58) | 1.06 (0.80, 1.41) | 1.13 (0.85, 1.49) |
| Other informal | 27.4 (18) | 1.06 (0.67, 1.68) | 1.21 (0.79, 1.87) |
| GCSE A-C | | | |
| Parent only | 21.6 (527) | | |
| Grandparent | 24.3 (251) | 1.12 (0.96, 1.31) | 1.12 (0.95, 1.32) |
| Other informal | 26.2 (64) | 1.21 (0.93, 1.58) | 1.23 (0.93, 1.63) |
| A/AS Levels | | | |
| Parent only | 16.8 (98) | | |
| Grandparent | 25.1 (71) | 1.50 (1.08, 2.08)* | 1.34 (0.96, 1.87) |
| Other informal | 14.8 (13) | 0.88 (0.47, 1.66) | 0.90 (0.47, 1.73) |
| *Diploma* | | | |
| Parent only | 22.5 (107) | | |
| Grandparent | 22.6 (68) | 1.00 (0.72, 1.40) | 0.98 (0.70, 1.36) |
| Other informal | 22.7 (19) | 1.01 (0.61, 1.67) | 1.06 (0.65, 1.74) |
| *Degree* | | | |
| Parent only | 19.8 (150) | | |

| | | | |
|---|---|---|---|
| Grandparent | 28.4 (99) | 1.44 (1.14, 1.81)* | 1.43 (1.10, 1.87)* |
| Other informal | 31.4 (34) | 1.59 (1.12, 2.26)* | 1.43 (1.00, 2.06)* |
| Lone parenthood | | | |
| *Lone parent* | | | |
| Parent only | 24.6 (279) | | |
| Grandparent | 25.3 (80) | 1.03 (0.79, 1.33) | 0.91 (0.68, 1.22) |
| Other informal | 27.0 (28) | 1.10 (0.71, 1.71) | 1.27 (0.82, 1.99) |
| *Couple family* | | | |
| Parent only | 21.7 (1241) | | |
| Grandparent | 25.5 (528) | 1.18 (1.05, 1.31)* | 1.20 (1.07, 1.35)* |
| Informal | 24.0 (137) | 1.11 (0.93, 1.32) | 1.13 (0.94, 1.35) |
| IMD (quintiles)^ | | | |
| *Most deprived* | | | |
| Parent only | 23.2 (349) | | |
| Grandparent | 27.1 (67) | 1.17 (0.92, 1.49) | 1.19 (0.92, 1.54) |
| Other informal | 25.5 (25) | 1.10 (0.75, 1.61) | 1.21 (0.81, 1.82) |
| *4* | | | |
| Parent only | 24.0 (208) | | |
| Grandparent | 27.0 (85) | 1.12 (0.89, 1.42) | 1.11 (0.86, 1.43) |
| Other informal | 29.3 (21) | 1.22 (0.81, 1.84) | 1.34 (0.89, 2.03) |
| *3* | | | |
| Parent only | 20.2 (147) | | |
| Grandparent | 27.9 (80) | 1.38 (1.07, 1.78)* | 1.39 (1.07, 1.80)* |
| Other informal | 25.2 (20) | 1.25 (0.80, 1.95) | 1.30 (0.81, 2.09) |
| *2* | | | |
| Parent only | 18.8 (112) | | |
| Grandparent | 23.7 (49) | 1.26 (0.93, 1.71) | 1.22 (0.90, 1.67) |
| Other informal | 22.2 (12) | 1.18 (0.69, 2.03) | 0.98 (0.55, 1.74) |
| *Least deprived* | | | |
| Parent only | 20.6 (129) | | |
| Grandparent | 19.4 (34) | 0.94 (0.67, 1.33) | 0.98 (0.68, 1.40) |
| Other informal | 19.3 (9) | 0.93 (0.51, 1.73) | 1.02 (0.55, 1.88) |

*<=0.05. ^ England only. [1] Adjusting for maternal age, ethnicity, number of children in household at age 3 years, pre-pregnancy maternal overweight, birth weight, smoking during pregnancy, NS-SEC, maternal education and lone parenthood, age in months. Missing: BMI 1247, childcare 926, NS-SEC 176, maternal education 31, maternal age at first live birth 428, ethnicity 31, maternal pre-pregnancy overweight 886, birthweight z score 169, smoking during pregnancy 60, no children in household 51, age 51

**Childcare and infant feeding in early infancy and overweight at 3 years**

As demonstrated in Chapter 7, informal childcare was associated with a lower likelihood of breastfeeding, and infant feeding habits have been linked to the development of overweight in systematic reviews[250;251], and in other studies utilising MCS data[25]. Therefore it is possible that the elevated risk of overweight observed in children who were looked after in informal childcare is in fact explained by their reduced likelihood of being breastfed. Table 8.7 presents risk ratios for being overweight according to childcare use before the age of four months for at least 10

hours a week. In the unadjusted analyses children who were cared for in informal childcare were more likely to be overweight than those who were only cared for by a parent (RR=1.16 [1.01, 1.33]). However, after controlling for confounders and SECs the association disappeared and it was not further affected by controlling for infant feeding. Exploring the association in those who had been cared for in the same main childcare type at age four months and 3 years (in order to allow for any spill-over effects from changes in childcare between infancy and the period from 9 months to 3 years) indicated that children who had only been cared for in informal childcare were at an increased risk of overweight (RR=1.22 [1.03, 1.43]). This was not altered when controlling for confounders (aRR=1.21 [1.01, 1.45]). Adjusting for breastfeeding reduced the RR only slightly to 1.19 (1.00, 1.43) and it remained statistically significant. Similarly, adding the introduction of solids to the model in addition to breastfeeding only reduced the RR slightly (1.18 [0.99, 1.41]), although it became non-significant. This implies that, in this instance, infant feeding does not mediate the association between childcare and overweight.

*Table 8.7: Association between childcare use in the first 4 months of life and overweight (including obesity) at age 3 years in the MCS: unadjusted and adjusted risk ratios (95% CIs) and controlling for infant feeding as a potential mediator*

| | **%(N) overweight** | **Unadjusted RR** | **Adjusted RR [1]** | **Adjusted RR [1]+ breastfeeding duration**** | **Adjusted RR [2] + introduction of solids^** |
|---|---|---|---|---|---|
| **Childcare use at 4 months (all children)** | | | | | |
| Parent only | 22.8 (2784) | | | | |
| Informal | 26.6 (235) | 1.16 (1.01, 1.33)* | 1.08 (0.92, 1.27) | 1.06 (0.90, 1.24) | 1.05 (0.90, 1.24) |
| Formal | 23.7 (58) | 1.08 (0.84, 1.38) | 1.03 (0.79, 1.34) | 1.03 (0.79, 1.33) | 1.02 (0.79, 1.33) |
| **Childcare use at 4 months (limited to children whose childcare type had not changed by age 3 years)^** | | | | | |
| Parent only | 22.1 (1,464) | | | | |
| Informal | 26.8 (147) | 1.22 (1.03, 1.43)* | 1.21 (1.01, 1.45)* | 1.19 (1.00, 1.43)* | 1.18 (0.99, 1.41) |
| Formal | 23.7 (50) | 1.07 (0.83, 1.40) | 1.09 (0.82, 1.43) | 1.09 (0.82, 1.43) | 1.07 (0.82, 1.41) |

*<=0.05. [1] Adjusting for maternal age at first live birth, ethnicity, number of children in household at age 9 months, pre-pregnancy maternal overweight, birthweight, smoking during pregnancy, NS-SEC, lone parenthood, maternal education. ** Categorised as never breastfed, breastfed for less than 4 months, breastfed 4 months or more. ^ Whether the mother introduced solids after the age of 4 months (yes, no).

Missing: BMI 1247, childcare before 4 months 104, NS-SEC 176, maternal education 31, maternal age at first live birth 428, ethnicity 31, maternal pre-pregnancy overweight 886, birthweight 169, smoking during pregnancy 60, breastfeeding duration 15, age at which solids introduced 12, number of children in household 51.

^ In order to limit the potential effect of subsequent childcare types

**Sensitivity analyses**

Several sensitivity analyses were conducted in order to address some of the limitations of the analyses and data. These are now summarised, the data are provided in Appendix 8.

Excluding children who were looked after in more than one type of childcare

Children were classified according to the main non-parental childcare that they received between 9 month and 3 years, and approximately 12% of mothers who reported using childcare had used two main arrangements over this period and 28% also used subsidiary childcare. The analyses were repeated excluding children who were looked after in more than one type of childcare between the age of 9 months and 3 years. The elevated risk of overweight in informal childcare remained in the more advantaged groups, although in some cases with a reduction in risk and also statistical power (Appendix 8, Table 8A1).

Exploring all childcare (i.e. including childcare lasting less than 10 hours a week)

In the main analyses childcare lasting at least 10 hours a week was reclassified as care only by a parent, because it was thought that shorter periods of childcare would have a minimal influence on diet and physical activity (and therefore weight status).This approach has been used elsewhere [244], and also when exploring childcare in relation to breastfeeding in Chapter 7. However several other approaches have been used in analyses investigating weight status, including looking at "part-time" (<35hr/wk) and "full-time" (=>35hr/wk)childcare [212], or "limited" (<15 hr/wk) and "extensive" (=>15 hr/wk) childcare[248] and these found that the shorter, as opposed to the longer, durations of childcare were associated with an increased risk of overweight. Appendix 8 contains the association between *any* childcare and the risk of being overweight, in order to consider the potential impact of employing the 10 hour cut-off. The elevated risk seen in informal childcare in the overall analysis was reduced and became non-significant. When stratified by SECs, the patterns were similar, with more advantaged groups experiencing increased risk of overweight if informal childcare was used. However RRs were smaller (for education and lone parenthood), or in some cases became non-significant (for NS-SEC) (Appendix 8, Table 8A2).

Controlling for time spent in childcare

Risk ratios for being overweight or obese in grandparent and other informal childcare varied according to whether it was part-time or full-time care. It therefore might be possible that the elevated risks seen in grandparent care in more advantaged groups might be due to longer durations of childcare used by more advantaged groups. However when exploring childcare type and duration, less advantaged groups used both part-time and full-time grandparent care more frequently than more advantaged groups (who were more likely to use formal childcare, both part- and full-time). When stratifying by childcare duration and SECs the increased risk seen in those looked after by a grandparent remained in the more advantaged groups and was greater for full-time than part-time care. However elevated risks also emerged in other social groups, such as those whose mothers had GCSE grades D-G and those living in the most deprived quintile. An increased risk emerged in children who were looked after by grandparents full-time if they lived in the most deprived or the second from least deprived areas in England. For couple families, an increased risk in other informal care was also observed if the care was full-time (Appendix 8, Table 8A3).

Taking into account age of grandparent

Grandparents in higher socio-economic groups tend to be older than those from lower socio-economic groups[146] and this was also consistently the case in the MCS (when exploring age of the mothers' mother by NS-SEC, maternal education and lone parenthood (data not shown)). Older grandparents might also be more sedentary and less likely to restrict access to sedentary activities (such as television viewing) or calorific foods than younger grandparents. Therefore it is possible that the elevated risk of overweight in the higher socio-economic groups is explained by the older age of grandparents. There is limited information collected in the MCS on grandparents, although at the third sweep (when the children were aged five years) the ages of the maternal and paternal grandmothers were reported if they were still alive. The analyses were repeated, controlling for the age of the maternal grandmother, since at the first sweep 72% of grandparents providing care were maternal grandmothers (this information was available for 80% of children included in the main analysis). This made no difference to the elevated risk observed in higher socio-economic groups (data not shown).

## 8.5 Discussion

### *8.5.1 Summary of findings*

Compared to those cared for only by a parent (or in childcare for less than 10 hours a week), children who were looked after in informal childcare between the age of 9 months and 3 years were more likely to be overweight or obese, particularly if the care was full-time or provided by grandparents. When investigating the association in different social groups, the elevated risk in informal childcare was only seen in the more advantaged stratum. The risk of overweight in children who were looked after in formal childcare did not differ from those who were only looked after only by a parent. Breastfeeding did not mediate the association between childcare and overweight. The associations observed in the unadjusted analyses were largely unchanged after controlling for confounders.

### *8.5.2 Strengths and limitations*

Strengths and limitations of the analysis are now discussed; more general issues related to the Millennium Cohort Study are discussed in Chapter 3 and the overarching strengths and limitations of the childcare data are discussed in Chapter 4.

To my knowledge this is the first study to have explored the relationship between childcare and overweight in the UK. The association was investigated in different socio-economic groups, and for these differentiated between formal and informal types of childcare, including care by grandparents. It was also possible to explore infant feeding as a potential mediator between childcare and overweight. It was possible to use an objective measure of overweight for this analysis. However 9% of children had missing or invalid BMI data and the sample weights were not designed to take into account this attrition. In addition, 7% did not have the relevant childcare data (a higher proportion were missing data for this chapter compared to Chapter 4, because information on hours spent in childcare was also required).

Childcare lasting less than 10 hours a week was reclassified as parental care only because it was thought that such short periods would be unlikely to influence diet and physical activity[244]. However time spent in childcare was based on the average period reported by the mother between 9 months and 3 years (where information at two time points was provided (See appendix 2)). It is likely that childcare intensity changed over this period, and for most children increased as they got older. When the analyses were

repeated looking at exposure to any childcare (i.e. including durations of less than 10 hours a week) the associations were, on the whole, similar in pattern but smaller in magnitude. When stratifying by time spent in childcare, full-time childcare tended to have higher risk ratios (for informal childcare) than part-time childcare. This suggests that longer periods of childcare lead to a greater risk of overweight.

Only the main non-parental childcare type was explored and approximately one third of mothers reported either changing childcare across the period in question, or using more than one type of childcare at the same time. Changes in childcare are particularly likely to have occurred towards the end of the period from 9 months and 3 years, as children became eligible for free 12.5 hours a week of early education. However 3% of children had not yet turned 3 at the time of survey and less than 6% could have potentially been exposed to the free childcare places for 6 months or more (assuming attendance started at age 3 exactly). The overall analyses between childcare and overweight were repeated for those who used only one type of childcare and the unadjusted and adjusted associations were very similar to those reported here, although with some reduction in power.

Whilst it was possible to control for a number of confounding factors, it is feasible that the families differ in some other way that could not be captured using the measures in the MCS. Controlling for TV viewing did not appear to confound the association. It was not possible to investigate the characteristics of the informal carers, although controlling for the age of the maternal grandmother did not influence the patterns for informal childcare, and informal carers (namely grandparents) tend to be from similar socio-economic backgrounds as the parents or mother[146]. Mothers were not asked about the children's diet or physical activity in the first or second sweep interviews and so it was not possible to explore whether these varied by childcare type. Having access to objective measures of physical activity and diet would have allowed the possibility that children looked after by grandparents are more likely to engage in sedentary activities and eat more unhealthy foods than those looked after only by a parent to be explored (as hypothesised, but not investigated, in a previous study[244]). This might be because grandparents are less able to partake in physically active activities with their grandchildren. Due to generational differences in diet they may also find it harder to prepare meals which are palatable to young children. It is also possible that, due to the differing nature of their caring role (and how they perceive it), many informal carers

(such as relatives) may less likely to restrict unhealthy foods and sedentary activities. Research is required to explore these hypotheses.

### *8.5.3 Comparison with other findings*

Similar to findings reported here, three studies based in the US reported that those who were cared for in informal childcare were at a higher risk of overweight than children who were cared for only by a parent. One investigated the impact of childcare type upon infant feeding habits and weight gain at age 9 months and found that infants who were cared for in informal childcare had gained more weight by the age of 9 months[212]. When taking into account time spent in childcare (no differentiation between childcare types were made), only part-time childcare was associated with an increased risk of weight gain. This may be because informal childcare was more likely to be part-time than full-time, although this was not explored in the paper. One of the other studies explored the association between weight status when entering kindergarten and childcare use that lasted at least 10 hours a week over the previous year and informal childcare was associated with a higher risk of adiposity[244]. A further US study exploring place of childcare found that children who had spent longer periods of time in someone else's home (but not in a centre or by a carer in the child's own home) between birth and six months had greater weight-for-length at age one year and higher BMI z-scores at age three, although there was no association with skin fold thickness at age three [245].

A US based study which explored the association between childcare between the ages of three and five and obesity at age 6-12 years[248] found that those who were cared for in centre-based childcare were less likely to be obese than children who were cared for either only by a parent or by an informal carer, although this only applied for children looked after for limited periods of time (less than 15 hours a week). The decreased risk observed in formal childcare may be explained by the inclusion of informal childcare in the baseline, or differences in quality of part-time compared to full-time formal childcare or in families using childcare for varying durations. A review of risk factors for childhood obesity[243] identified two studies of the same Japanese cohort which explored the impact of nursery school attendance and being cared for by a father or grandparent on overweight in preschool children and neither found that childcare was linked with overweight[246;247]. However one of these[246] found that children who were cared for only by their mother or who attended kindergarten were less likely to snack at irregular times (when compared to being cared for by the father or a grandparent) and

those who were cared for only by their mother were more physically active. When exploring informal childcare in more detail in this chapter, it was found that children cared for by grandparents were at a greater risk of overweight than those looked after by other informal carers. However when stratifying by time spent in childcare, the increased risk was seen in full-time childcare provided by other informal carers as well as part- and full-time care by grandparents.

Two US studies explored the association between childcare and overweight by measures of poverty and income and neither found a significant interaction[244;248], although one found an interaction with Latino ethnicity[244]. In this chapter the association between childcare and overweight was explored in different socio-economic groups and children whose mothers had higher educational qualifications, were from managerial & professional backgrounds, or who lived with a partner were at increased risk of overweight if they were looked after in informal childcare (whereas those from less advantaged backgrounds were not). These differences were not observed in the analyses stratified by area deprivation; this may indicate that the differential effect of childcare operates at a household rather than area level.

Two of the studies reported above also explored infant feeding as a potential mediator between childcare and weight status[212;245]. One found that infant feeding did not mediate the association between childcare and weight gain in infancy, although using cross-sectional data which may have limited its ability to detect such an effect[212]. The other found that the association between care in someone else's home in the first six months of life and adiposity at age one and three years was mediated only slightly by breastfeeding duration[245]. When infant feeding was explored as a potential mediator between childcare in infancy and overweight at age 3 in this chapter, there was no evidence of mediation.

### *8.5.4 Implications for policy, practice and further research*

The most recent childcare strategy (which was introduced under the Labour administration in 2004) aimed to increase the proportion of childminders who are registered and therefore regulated[17]. However the majority of informal carers in this study were grandparents (and not unregulated childminders), and this is confirmed by other national data[149;252;253]. Free formal childcare places are currently available to all children aged 3 to 4 years for 12.5 hours a week for 38 weeks a year[17], and was

extended to 15 hours a week in 2010[142]. Children looked after in formal childcare did not appear to differ from those looked after only by a parent and so increases in formal childcare use are unlikely to influence levels or inequalities in overweight.

Parents of preschool children may find it difficult to find or afford formal childcare which "wraps around" this free quota[254] and so may turn to family members for help. It is well recognised that parents value grandparental care and consider it to be the best alternative to full-time parental care, particularly with respect to the emotional wellbeing of young children[255]. However in this chapter only one aspect of children's physical wellbeing has been explored, and findings indicate that being cared for by an informal carer may increase the risk of being overweight. Efforts to provide informal carers with relevant support and information are therefore necessary. Research suggests that grandparents view their provision of childcare differently from other informal carers, and that policies to provide cash payments may be seen to 'devalue' their care giving role[256]. However the proposal to provide grandparents with National Insurance credits for caring for grandchildren from 2011[144] potentially provides an opportunity for health promotion. Although no association between formal childcare and overweight was observed in this chapter, there is still a need for the introduction of training and regulation to ensure that children are provided with healthy snacks and meals when in childcare. Further research investigating childcare practices used in different types of childcare, particularly with respect to diet and physical activity and in different socio-economic groups, may help to target health promotion more effectively. Qualitative research could also be used to highlight how carers might be better supported.

## 8.6 Summary of findings

- Data from the Health Survey for England (HSE) indicate that childhood overweight (including obesity) has levelled off in recent years, but still remains high, with around one quarter of children being overweight or obese by the time they reach school age. In the MCS 23% of children were overweight or obese at age 3 years and those from less advantaged backgrounds were more likely to be overweight.
- Children who were cared for in informal childcare (75% of informal carers were grandparents) for at least 10 hours a week, between the age of 9 months and 3 years, were more likely to be overweight or obese than children who were cared for only by a parent, particularly if they were cared for full-time.

- When stratifying by socio-economic background, the increased risk of overweight in informal childcare (compared to parental care only) was limited to children from more advantaged groups. There was no association between formal childcare and overweight.
- Breastfeeding did not mediate the association between childcare use in infancy and overweight at age 3 years.

In the following chapter two sessions held with a young people's public health reference group, to discuss various findings discussed in this thesis, are described.

# 9 Chapter 9 – Involving young people in public health research and obtaining their views

In order to engage young people in public health research, and to gain their views on some of the work presented in this thesis, two sessions were held with a young person's reference groups known as PEAR (Public health, Education, Awareness, Research) **http://www.ncb.org.uk/pear/home.aspx**. PEAR is funded by the Wellcome Trust and facilitated by the National Children's Bureau, and the group meets regularly to discuss various public health issues. In this chapter the methods used to involve the group in the project through attending two of these meetings are described, and the outcomes of the sessions are summarised.

## 9.1 Objectives

- To engage young people in public health research
- To gain the views of young people at two different stages in the project:
    - At the beginning: regarding how the government could influence unintentional injuries and how childcare might influence children's health (9.3)
    - At the end: focussing on what the findings from the MCS analyses might mean and what the government might do to improve child health as a result (9.4)

## 9.2 Background

The United Nations Convention on the Rights of the Child places in law the right for young people to have their voices heard on matters that affect them[257;258]. In the UK there is a growing recognition of the value of children and young people's participation in health research[259]. Participation is defined as the taking part and the acknowledgement of participant's actions or views, which may in turn be acted upon[257]. Children and young people's involvement in research can benefit both the participants and the research. Skills and self-esteem can be enhanced through participation, and lead to a sense of empowerment[257;258;260]. Involvement in research enables children and young people to meet new adults and peers, and can aid future employment or educational opportunities through enhancing their curriculum vitaes[260]. Furthermore the involvement of children and young people in research can illuminate key issues and concerns that professionals or researchers might miss[260], and raise new insights into

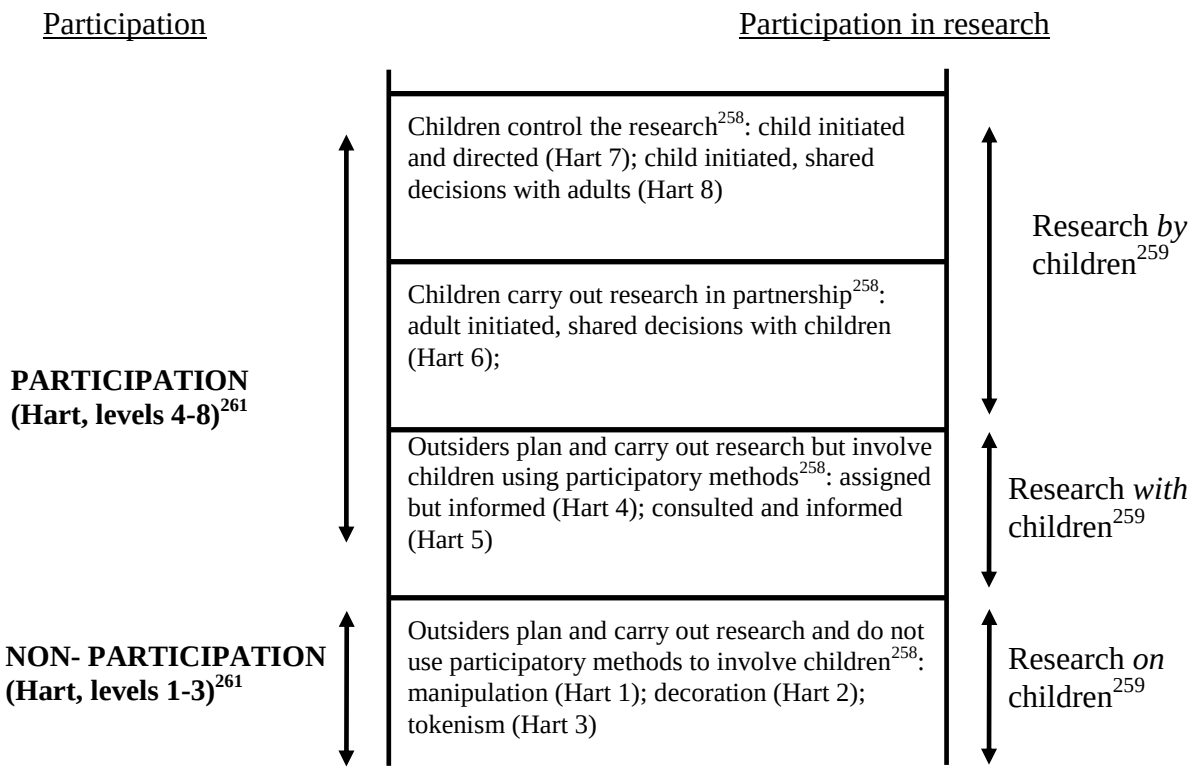
children's worlds and their views of the adult world around them[259]. This can help support decision making and improve policies relevant to children's lives[257]. Most children and young people feel that they should have a say in matters that affect them, and some think that they are not given sufficient opportunity to do so[257]. Through conducting research with children and young people, traditional organisational structures and cultures of participation can be challenged, and the beginning of an ongoing dialogue with them initiated [260].

There are different degrees of participation that young people can have when being involved in decisions surrounding matters that affect their lives and the communities in which they live. Levels of participation have been defined in several ways[259;261], as captured in Figure 9.1. One of the most renowned is Hart's ladder of participation which consists of eight levels of participation[261]. The first three are levels of non-participation, ranging from manipulation (whereby children's input is used to shape outcomes to suit the purpose of adults) to tokenism (where children are apparently given a voice but with little or no control over the process or opportunities to form their own opinions)[261]. Focussing specifically on children and young people's involvement in research, Clavering and McGlaughlin refer to these three levels as "research *on* children"[259].

In Hart's ladder, levels four to eight represent various degrees of participation. The most limited (level four) is referred to as "assigned but informed", where children understand the intentions of the project and have a meaningful role, but have little input or understanding of the research and subsequent decision making process. Following this is rung five "consulted and informed". Whilst the project is still designed and run by adults, the children are aware of the process and their opinions are taken seriously. In the context of participation of research, Wilkinson refers to levels four and five collectively as adult researchers planning and carrying out research whilst involving children with participatory methods[258]. Clavering and McGlaughlin refer to this level of involvement in research as "research *with* children" and point out that the research methods and dissemination remain in the domain of the researchers[259]. The top three rungs of Hart's ladder are where children initiate or control the direction of the project (either independently or jointly with adults), and are involved to some degree with the decision making. Clavering and McGlaughlin refer to these three rungs jointly as "research *by* children", although Wilkinson makes the distinction between research

which is carried out in partnership with adults, and research where children have independent control over at least some aspects of the project[258].

*Figure 9.1: Participation ladder to demonstrate the different levels of children and young people's participation in research.*




Adapted from Clavering & McLaughlin 2010[259];Hart 1992[261];Wilkinson 2000[258]

In certain circumstances it may not always be possible to involve children and young people in research, for example due to time or budget constraints, or inadequate skills on the part of the research team[258]. Recruiting children to participate in research is complex because children cannot be approached directly, adult consent is required, and their participation is controlled by a "hierarchy of gatekeepers" such as ethics committees, professionals and parents[257]. For this programme of research it was possible to meet with an existing public health reference group, run by the National Children's Bureau (NCB), in order to involve young people in the project and to gain their views as the next generation of parents. The extent of their involvement might be classified as involvement *with* young people, and placed on Harts ladder of participation somewhere between levels 4 (assigned but informed) and 5 (consulted and informed). However the Wellcome Trust funded project which created the PEAR group might be placed further up the ladder of participation, at around levels 6 (adult initiated, shared

decisions with children) or 7 (child initiated and directed), since the group decided what they would like to do at their meetings and what types of work they would like to hear about. In addition to this they are conducting their own research project about Cyber-Bullying, and are leading their own public health conference in October 2010, which will be attended by young people, public health researchers and policy makers (http://www.ncb.org.uk/pear/).

PEAR, formerly known as the Young People's Reference Group on Public Health, was set up to enable young people to contribute to public health research and decision making in the UK. The group was formed in 2005, and consisted of up to 15 members aged 12-16 years (10 male, five female). The group meets four times a year during the school holidays, and although members have changed since 2005, the demographics remain similar.

Guidelines on participatory research, such as focus or reference groups, make recommendations for the age composition of group members, the location and timing of meetings, the setting environment (such as lighting, temperature and seating plans), session length, and the role and approach of the moderator[260;262]. Since the PEAR group was organised and run on a regular basis by the NCB many of these considerations had already been dealt with. Meetings are typically timetabled during the school holidays, from 10.00am-16.00pm, and the two sessions that were held for this project were each assigned slots of 50-60 minutes. Planning the two sessions involved deciding upon the topic, approach and materials to be used. There are a number of participatory methods that can be used to engage young people in research, for example unstructured or semi-structured interviews, focus groups, individual or collective drawing, story boards, role play and visual techniques such as maps, diagrams or drawing[258]. Because the NCB had been working with the reference group for some time and were aware of the group dynamic, the sessions were planned in consultation with the group facilitator and in discussions with the young people. The approach and methods used in each session are described in subsequent sections. Ethics approval was obtained from UCL Research Ethics Committee in November 2007 (1271/001).

## 9.3 Session 1: How might government actions influence health in the early years? Using the examples of unintentional injury and childcare.

### *9.3.1 Methods*

When conducting research with young people, INVOLVE (a public participation organisation http://www.involve.org.uk/) recommends that participants become involved as early on in the research process as possible[260]. The first session was held with the PEAR group in February 2008, after the review of reviews had been conducted for the two case studies and the first draft of the maps of review evidence had been produced. The aim of the session was to gain the group members' views on how they thought the government could influence injuries in young children, and how childcare might influence health in the early years.

Four young people (all male) attended the session. The first 10 minutes were spent introducing the group to the overarching aims of the project, and the objectives for that day. A discussion took place about how the government might influence children's health, using an introductory summary sheet. Language suitable for the age group was used (for example policies were referred to as 'government actions') and two examples were worked through as a group, with the aid of coloured diagrams (see Appendix 9.1). The first example demonstrated how maternal employment might influence children's health, and the second explored the ways in which government actions could affect obesity in children. Because the use of visual aids and practical exercises are recommended when working with young people[258], the group was then asked to divide into two pairs and create a flowchart, using coloured sheets of paper and pens. Pair one created a flowchart to demonstrate what they thought the government could do to reduce injuries in childhood, and pair two focussed on how they thought childcare might influence different aspects of child health. The intention was that the flowcharts might be comparable to the maps which had already been produced by the project team based on the review of reviews (Chapters 3 and 4). The pairs were not asked to think about how government actions could influence *inequalities* in health because it was thought that this would be too complex given the time available (although as noted subsequently, in some cases the young people did indirectly consider differential effects).

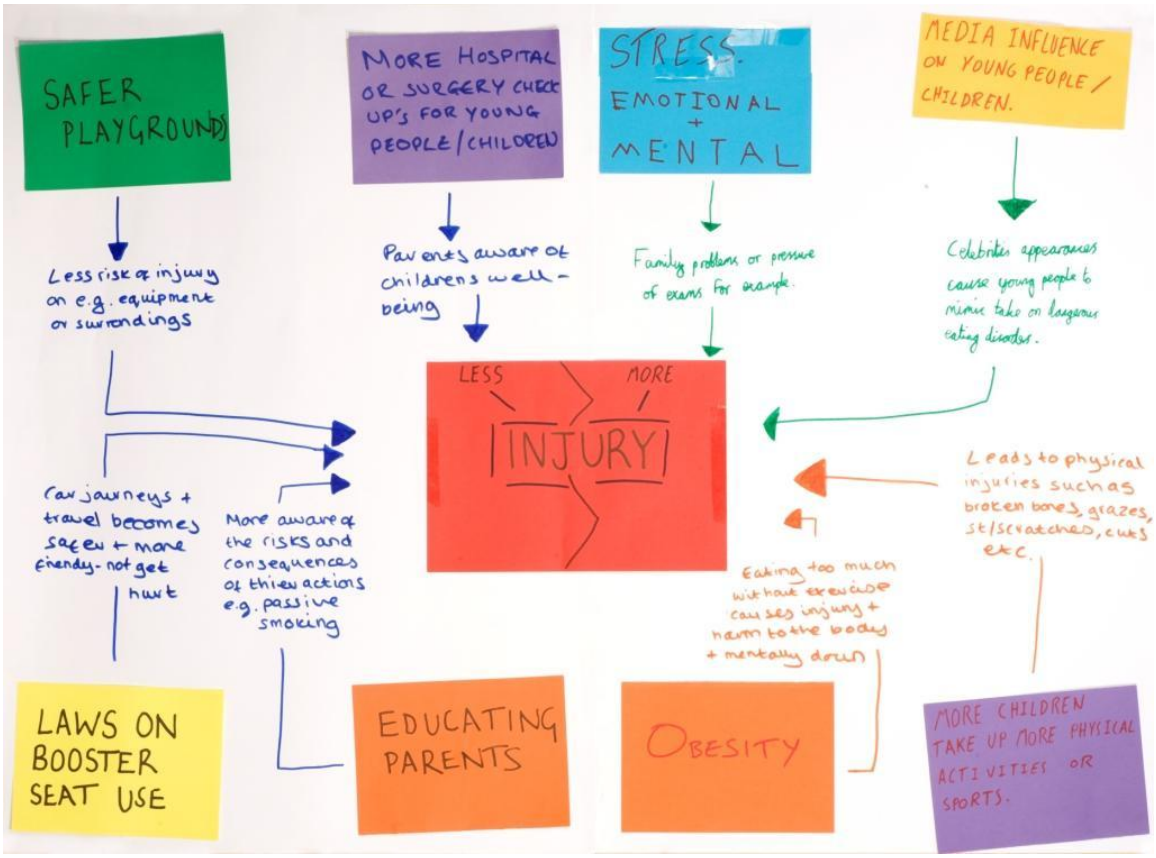
Pair one was provided a worksheet which described their task and gave definitions of government actions and injuries (Appendix 9.2). They were also provided with some examples of potential 'government actions' (laws on booster seat use, parental education, and safer playgrounds) that they could use when creating their flowchart, but were encouraged to think of their own ideas too. The second pair was provided with a work sheet (Appendix 9.3) containing definitions of childcare and health. They were also provided with some examples of areas of health that childcare could influence (IQ, physical activity, infectious disease) and were encouraged to think of other aspects of health themselves. The pairs took half an hour to create their flowcharts. Following this the charts were stuck up on the wall and discussed as an entire group for approximately 10 minutes. The final five minutes of the session were spent relaying to the group how the flowcharts and discussion would be used to inform the rest of the project, and how they would be provided with feedback (a written report was circulated at the following meeting, Appendix 9.4).

### *9.3.2 Results*

**Pair one: injuries**

Figure 9.2 presents a photo of the flowchart that was created by pair one, demonstrating how they thought that the government might influence injuries in children. As mentioned previously, the flowchart does not contain an inequalities component since it was felt that this would complicate things, and also because the map of review evidence produced in Chapter 3 also excluded an inequalities element.

*Figure 9.2: Flowchart created by the PEAR group to demonstrate how the government might influence injuries in children*




Despite the definition of injuries that the pair had in their worksheet ("anything from minor scrapes and bruises, to poisoning, smoke inhalation and serious head injuries"), they decided that unintentional injuries were not only physical, but also included emotional or mental harm. The PEAR group thought that the government might influence childhood injuries through educating parents about the risks and consequences of smoking. If parents became less inclined to smoke in their children's presence, then this would reduce the likelihood of children suffering from negative health consequences of passive smoking. The focus shifted away from very young children in the session (possibly due to the age of the PEAR group) and the role of media and risky health behaviours was raised as factors that could influence older children. The group suggested that the government could promote more positive role models as a way of counteracting the negative impacts that media could have on health behaviours, such as the development of eating disorders. The pair considered obesity to be a form of injury, which could arise through eating too much and not exercising enough. They also highlighted some unintended effects, for example the risk of broken bones and grazes that might arise through encouraging physical activity. Picking up on the examples

provided also highlighted that booster seats could reduce the dangers of car journeys and that safer equipment in playgrounds could reduce injury. They suggested that leaflets with advice on good practice and websites for further information could be given out at birth, particularly to first time parents. Although the young people were not asked to consider differential effects, members of the group did discuss how different parents may react differently to education and advice, and in some cases this could have a negative effect.

**Pair two: childcare**

Figure 9.3 contains the photo of the childcare flowchart that pair two produced. Like the injury flowchart produced by pair one, it does not contain an inequalities element. When considering childcare the pair thought that quality, cost, and type was important, particularly in relation to what the alternative to childcare would have been (for example household conditions). The balance between cost and quality was raised; more expensive childcare would probably provide healthier food, but at the same time the increased cost could mean fewer resources to buy healthy food at home. Using the examples provided the pair felt that exposure to greater numbers of children in childcare centres could provide greater opportunities for physical activity (e.g. playing games), but at the same time infectious diseases could spread more quickly. By using childcare, mothers would be able to get a job and bring economic stability to their family, although mother-child relationships could be disrupted. The group also pointed out the opportunities for relationships with other children that could arise from attending childcare might be positive through the development of friendships, or negative from bullying. Using the example provided, childcare was linked to higher IQ because children would be receiving early education from professionals. However the group felt that personal experiences of childcare should be taken into account; children who did not have good experiences in childcare might be less willing to learn when they started school. This would not only affect the individual but also their peers, who may receive less attention in the classroom as a result. It was concluded that by offering free or subsidised childcare of a consistent quality the government could limit the need for parents to balance quality and cost. Although the definition of childcare put to the group included both informal and formal childcare, the group focussed on childcare centres.

*Figure 9.3: Flowchart created by the PEAR group to demonstrate how childcare might influence the health of young children*

## 9.4 Session 2: Findings from the Millennium Cohort Study – what do they mean and what should the government do in response?

### *9.4.1 Methods*

The second session was held with the PEAR group later on in the project, in order to gain their views on some of the findings from the MCS analyses (Chapters 5-8). The meeting took place in February 2010. Six members attended the meeting, three females and three males (one of the males had attended the previous meeting in 2008). The main aim of the session was to feedback on progress since the last session (since this has been highlighted as being important to children and young people who participate in research[260;262] and was requested by the group), and to gain the members views on what might explain the relationships observed in the MCS analyses and what the government could do to improve young children's health in these particular areas. Firstly PowerPoint slides were used to present the overarching aims of the project and to feedback on how the last session with the PEAR group had contributed to the project (Appendix 9.5). Following this, and still using PowerPoint slides, the objectives of the session were presented, definitions were provided (such as government actions), and an example was worked through as an entire group, using some results from the analysis which explored childcare use in relation to breastfeeding (Appendix 9.5).

The PEAR group then divided into three pairs and spent the next 30 minutes discussing some of the findings from the remaining sets of analyses, each pair focussing on a different area: safety equipment use and injury in the home (pair one), childcare and injury (pair two), childcare and overweight (pair three). Each pair was provided with worksheets which summarised some of the findings from the analysis that they had chosen. The sheets were designed so that they used language appropriate for young people and visual aids, such as bar graphs to present the results, and photographs to help them focus on the relevant age group or setting (Appendices 9.6-9.8). The pairs were encouraged to spend five minutes reading through the worksheets, discuss the questions amongst themselves, and then create a poster to summarise their ideas using A3-sized sheets of paper and coloured pens. Following this the sheets were stuck to the walls and discussed as an entire group.

### *9.4.2 Results*

**Group introductory example: Childcare and breastfeeding**

As highlighted previously in this chapter, findings from the analysis exploring childcare in relation to breastfeeding (Chapter 7) were used as an example to introduce the group to the session and help them structure their ideas when breaking up into pairs to focus on the other results. Therefore there is no poster produced by the young people for these findings, although the points which were discussed by the group are now summarised. These were mainly ideas offered by the young people themselves, although sometimes with prompting. The PowerPoint slides used to discuss these results are provided in Appendix 9.5).

The group discussed why mothers who used childcare might be less likely to breastfeed overall, and why lone parents in particular were *more* likely to breastfeed if they used childcare compared to lone parents who looked after their baby themselves. The group thought that mothers who use childcare might be busy with balancing their work and home life and would therefore have less time to express milk to take to the childcare centre. Because these babies would be receiving formula milk in childcare, their mothers may then decide to give them formula milk all of the time. When considering the higher rates of breastfeeding in lone parents using formal childcare, the group thought that these mothers are probably working and so might get information about breastfeeding when at work. They might also meet other mums at the childcare centre who can swap advice and information.

When thinking about what the government could do in response to these findings it was agreed by the group that employers could provide crèches so that mothers can breastfeed in lunch breaks, or provide rooms so that mums can express milk, and that childcare providers should provide fridges to store expressed breast milk.

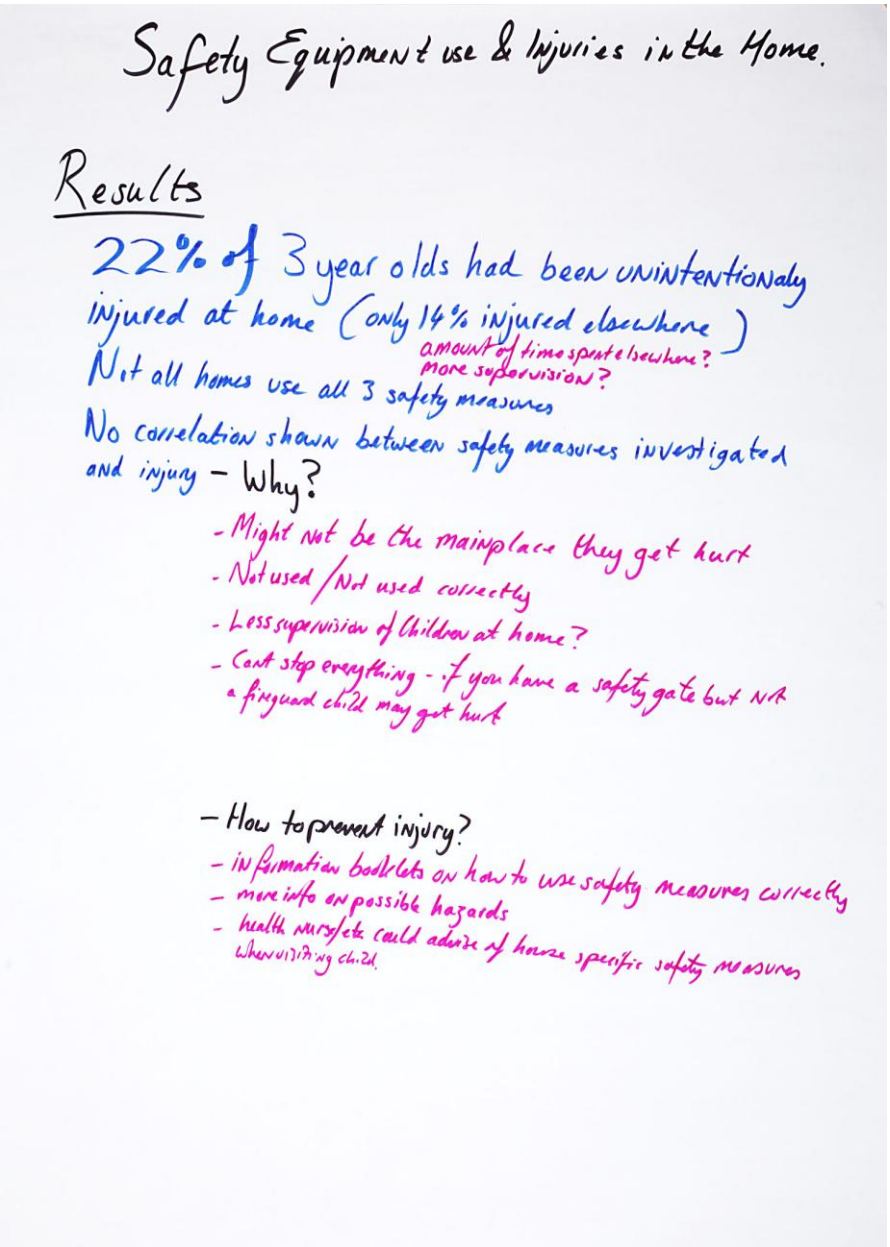
**Pair one: Home environment and injury**

The first pair was asked to think about possible explanations for why the results from the analysis exploring the home environment in relation to injuries (Chapter 5) implied that using safety equipment did not influence injuries occurring in the home. They were also asked to think about what the government might do instead to reduce injuries. Figure 9.4 presents a photo of the poster that the pair created. When the pair talked through their poster with the rest of the group, they felt that the reasons behind the lack

of an association between safety equipment use and injury could include the possibility that parents are less safety aware when at home compared to being elsewhere. This touches on the theory of risk compensation, whereby the presence of safety guards made individuals (both parents and children) less risk averse[176]. The group felt that safety equipment ownership and use does not necessarily mean that the equipment is being used correctly, that safety equipment cannot protect against all types of hazards and injuries, and that not all injuries can be avoided.

Alternative government actions they thought could be taken in order to reduce injuries were to provide information booklets to parents about how to use equipment correctly and to highlight other hazards in the home which could not necessarily be prevented by safety equipment. They suggested that health visitors could also be used to provide advice about specific hazards relevant to each household when carrying out routine visits, and that it was also important to adapt advice to the developmental stage of the child.

*Figure 9.4: Poster created by the PEAR group to explain why safety equipment may not influence injuries and what the government could do instead.*




**Pair two: Childcare and injury**

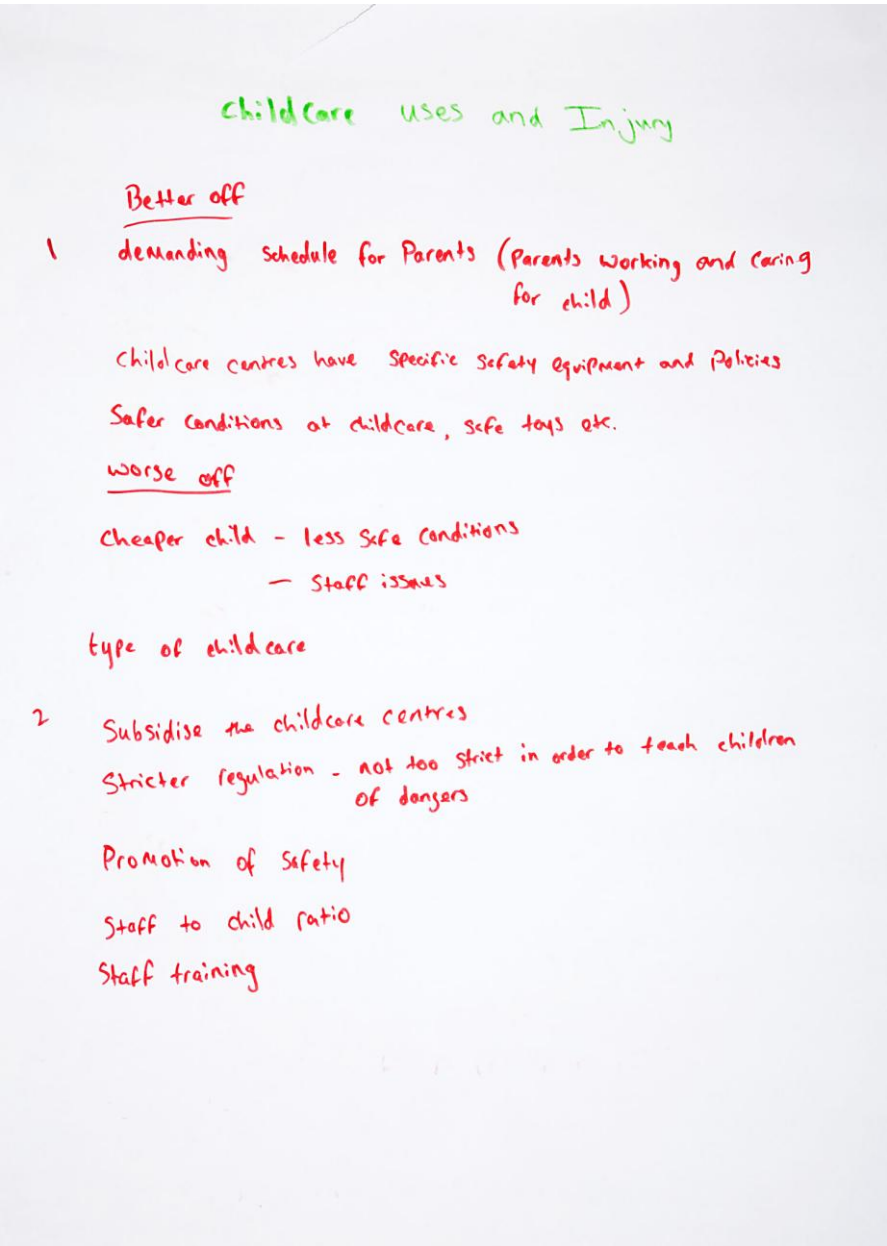
The second pair was asked to think about possible explanations for why formal childcare appeared to be protecting against injuries in infants from more advantaged backgrounds, whilst having a detrimental impact in infants from less advantaged backgrounds (Chapter 6). The poster created by the pair is provided in Figure 9.5.

The main explanation offered by the group for the differential association between childcare and unintentional injuries was variation in quality. They felt that infants from

more advantaged backgrounds were more likely to attend better quality childcare centres which would be more likely to have safety equipment and safer toys, safety policies, better qualified staff, and higher staff to children ratios. In contrast they proposed that infants from less advantaged backgrounds might attend childcare centres which were of poorer quality; offering less safe conditions and suffering from staffing issues. Although outside the scope of the session (which was focussed only on childcare centres), they pointed out that the less advantaged families might also be using different sorts of childcare than those from better-off backgrounds (such as informal childcare).

Moving on from this discussion, the group then talked about what changes could be made by the government to reduce injuries through childcare centres. They felt that subsidising fees to attend good quality childcare centres could equalise the quality of care received by children from different backgrounds. Stricter rules about what children can and can't do and how they should be kept safe might also help reduce the risk of injury, although they highlighted that rules should not be too strict as this will prevent children from enjoying and learning. Increasing staff to child ratios and better training could be beneficial, alongside the promotion of safety in childcare more generally.

*Figure 9.5: Poster created by the PEAR group to demonstrate why attending childcare may have a differential impact on injuries in children and what the government could do in response*




**Pair three: Childcare and overweight**

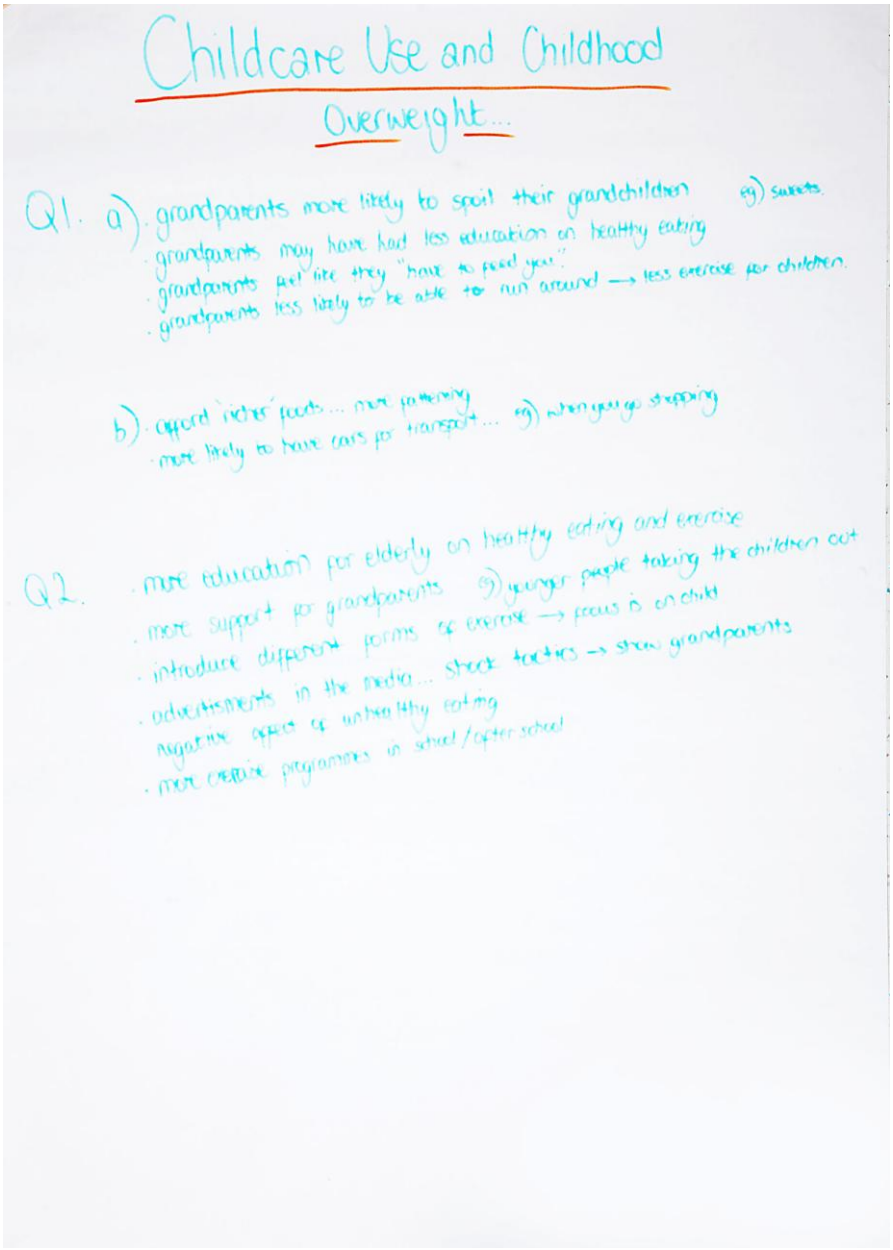
The third pair discussed why children who are cared for by their grandparents are at greater risk of becoming overweight than those who are only looked after by a parent (Chapter 8). The poster created by the pair is shown in Figure 9.6. When the findings and the poster were discussed as a group it was thought that grandparents like to spoil their grandchildren, for example by giving them sweets. The young people suggested

that, due generational differences, grandparents may know less about the importance of young children eating healthily and being active than parents of young children. Because they were older it was also postulated that they would be less able to run around or be physically active. The group felt that grandparents might consider it to be their role to feed their grandchildren.

When thinking about why only more advantaged children were more likely to be overweight if they were looked after by a grandparent, the group thought that more advantaged grandparents have 'richer' foods which could be unhealthier than foods provided by less advantaged grandparents. The group hypothesised that they might give children more to eat; one member of the group gave the following example: a better off grandparent might give the child as much cake as they like, whereas the less advantaged grandparent would have to ration it. In addition to this, more advantaged grandparents might be more likely to have a car or use taxis whereas less well-off grandparents would be more likely to walk and use public transport.

When discussing what the government could do to address this issue, the group suggested that the government provide more education about healthy diets and exercise for the elderly, including shock tactics. The group thought that more support for grandparents who are carers could help, for example providing places or people to take grandchildren to be physically active, and supplying information about different types of exercise they can do with grandchildren. They proposed that health promotion should be directed at grandparents through the media, and more "exercise programmes" should be offered (school clubs and out of school) which grandparents can take grandchildren to.

*Figure 9.6: Poster created by the PEAR group to demonstrate why children looked after by grandparents might be more likely to be overweight and what the government could do to counteract this*



## 9.5 Discussion

### *9.5.1 Summary of findings*

In this chapter two small pieces of participatory work conducted with a young person's public health reference (PEAR) have been described. Two sessions were held in February 2008 and February 2010, towards the beginning and towards the end of the project. The group appeared to find the first session enjoyable and engaging, and a lot of ground was covered considering the short amount of time. The discussion around the injury flowchart raised the broader definition of injury (including mental and emotional harm) that young people may relate to (for older children). The group tended to focus on formal childcare centres rather than informal childcare types, and a proportionately large amount of the time was spent considering the characteristics of childcare, such as quality and cost, rather than specific aspects of health that might be affected by it. The broad range of topics covered meant that most areas were only dealt with superficially and the group tended to focus on associations rather than mechanisms. The content of the flowcharts and discussion were not dissimilar to the maps of review evidence (Chapters 3 and 4).

The group also appeared to find the second session enjoyable and engaging. It has been emphasized in the literature that young people particularly value feedback about how their participation contributed[260;262]. Comments from the young people at the end of the second session highlighted that the feedback provided to them, about how the first session had helped to inform the project, was highlighted as one of the best parts of their day-long meeting (See Appendix 9.10). In terms of benefits of the work with the young people to the project, the session highlighted areas where young people felt problems might be arising and how improvements might be made. The young people often used personal experiences or individual anecdotes to conceptualise their ideas rather than thinking on a population level, although in doing so they did raise the potential for differential effects or unintended outcomes.

### *9.5.2 Strengths and limitations*

The majority of participatory work is *on* children[261], conducted by adults and consulting with other adults who are able to speak on the behalf of children (such as parents, teachers and health professionals)[259]. In this chapter two small pieces of participatory work have been described that have been conducted *with* young people, falling somewhere between levels 4 and 5 on Hart's ladder of participation ('assigned but

informed', and 'consulted and informed'). It was not possible to fully achieve level five, since the project's research questions and design had to be determined at grant application stage and therefore without the input of the young people. However the PEAR project as a whole rates higher on the ladder of participation. There was only sufficient resource to meet with them twice throughout the duration of the project. However because the sessions were held towards the start and end of the project, the young people were able to obtain some insight into the project before it was fully developed and a feel for the main findings towards its conclusion. Unfortunately, due to the time lag between sessions (two years), membership of the group changed between sessions and so only one of the original group members attended both sessions.

The sessions with the PEAR group were not intended to be qualitative research, but a means to involve young people in the project and to gain their views as the next generation of parents. Although they might not be considered the most relevant age group for the research discussed in this chapter, the benefits of being involved in research are considerable for young people[258-260]. Furthermore existing links with the National Children's Bureau, which was routinely carrying out group meetings, enabled the research to be carried out within the limited timeframe and resources available for this programme of research. The NCB facilitators were aware of the group dynamic and the types of tasks which the group responded well to, and the members were well rehearsed in public issues and academic research through previous meetings. Whilst this contributed to making the sessions engaging and productive, the responses might not be representative of all young people. Furthermore, in the first session only males attended. However research of this nature is not intended to be generalisable or representative but indicative[263].

The focus of the project (injuries and childcare) was not decided until a few months into the project. However existing connections with the NCB and the already established public health reference group, PEAR, made this piece of participatory work possible.
Had the focus been known at grant application stage, and had there been more resource available for participatory work, then it may have been valuable to conduct interviews with childcare professionals and parents. Involving young children may have provided a valuable perspective from those who are most affected by childcare and the home environment. Such work has been conducted in the past with children as young as 3-4 years, by observing their responses to different nursery classroom techniques[264].

However involving such a young age group is resource intensive and was not possible within the scope of this project.

The findings relating to childcare and breastfeeding were used as an introduction to the second session. Some examples and ideas were provided in order to stimulate their thinking when working alone in pairs and some prompting was also required to encourage discussion (see Appendix 9.5). Therefore the thoughts from the PEAR group surrounding childcare and breastfeeding are likely to be more heavily influenced by the facilitators than for the other areas which were discussed. However the group did contribute their own thoughts to some extent, and the quality of the posters, and discussions surrounding the other analyses implies that using this analysis as an example was valuable.

Discussions from the first session were similar to issues raised in the map of review evidence, and in the second session many ideas for policy changes to improve child health were already in existence. Whilst this indicates that the young people were engaged and understood the aims and objectives of the session, it might also be argued that this piece of work did not add a great deal of value to the project, particularly given the level of input required when preparing for the sessions. However the young people said that they had benefited from participating, and the material and methods employed provide a base that can be built upon in future work.

## 9.6 Summary of findings

- Participatory research with young people is increasingly being recognised as valuable and necessary.
- Two sessions were held with a young people's public health reference group run by the National Children's Bureau, to involve young people in research and to hear their views.
- The extent of their involvement might be classified on Harts ladder of participation as somewhere between levels 4 (assigned but informed) and 5 (consulted and informed).
- PowerPoint presentations, visual props and group exercises were used to gain the young people's views at two points in the project, regarding:
    - how the government might influence injuries in children and how childcare might influence health

    - what the findings from the MCS analyses (presented in Chapter 6-8) mean and what the government should do as a result.
- Both sessions were productive given the time frames, and the young people appeared to find them enjoyable and engaging.

# 10 Chapter 10 – Synthesis of findings

The aim of this thesis is to explore how policies in the early years might influence inequalities in health, focussing on two case studies, and using evidence from a number of sources (or "jigsaw pieces"). A significant portion of time was also invested in selecting the case studies and setting the policy scene. The majority of 'jigsaw pieces' used have been epidemiological in nature and derived from secondary data sources, although findings from existing research have also been taken into account.

In this chapter findings presented throughout this thesis are drawn together. Firstly, the policy context, trends and inequalities are summarised alongside the associations between the policy areas and health inequalities for the injury (Chapters 3, 5-6) and childcare (Chapters 4, 6-8) case studies in turn. These findings are then synthesised using a narrative approach, for both case studies together, in light of current and future policy. Since this is a synthesis of information reported throughout this thesis, there is some inevitable repetition of findings.

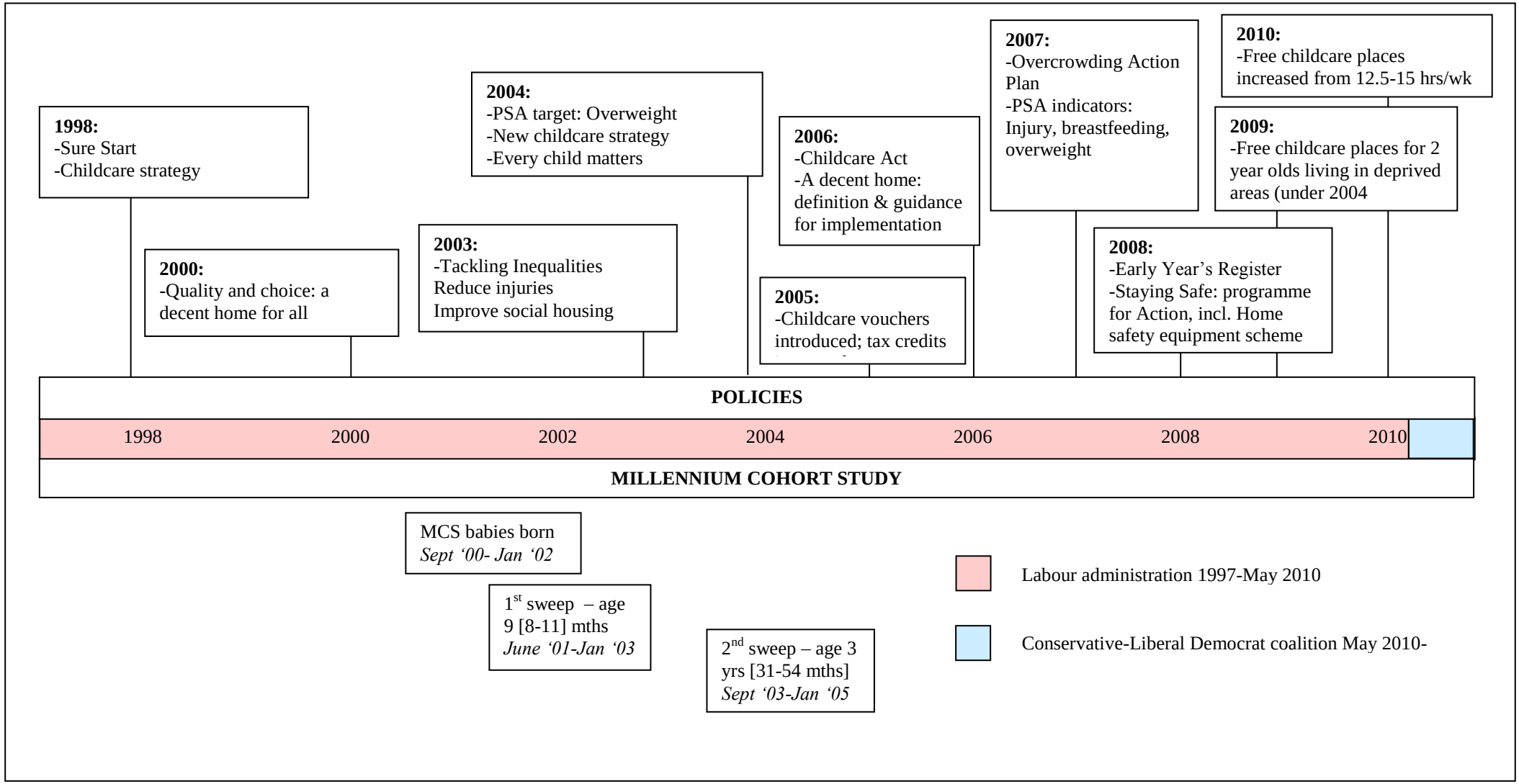
As shown in Figure 10.1 overleaf, the MCS children were born in 2000-02 and the analyses refer to two periods from birth to 9 months (spanning 2000-03) and from 9 months to 3 years (2003-05). Therefore findings are synthesised in light of the policy context experienced by the MCS families in 2000-05, and policy changes which have occurred since then. Potential changes under the new Conservative- Liberal Democrat coalition, which came into power in May 2010, are briefly considered, although most of the analytical work for this thesis preceded the general election.

## 10.1 Objectives

To bring together the information presented throughout this thesis for unintentional injury (10.2) and childcare (10.3) using information on:

- Policy context (first presented in Chapters 3-4)
- Trends and inequalities (first presented in Chapters 3-4)
- Associations from the MCS analyses (first presented in Chapters 5-8)
- To synthesise this information using a narrative approach, in light of current and potential future policy making (10.4)

*Figure 10.1: Timeline demonstrating key policies and the Millennium Cohort Study dates*



## 10.2 Unintentional injury case study: summary of findings

### *10.2.1 Policy context for injuries and the home environment*

Unintentional injury is the main cause of death and morbidity in childhood in the UK. In England in 2004/5 there were almost 120,000 admissions to hospitals in 0-14 year olds and approximately 2 million visits to A&E were made due to unintentional injury in children, costing the NHS £146 million[114]. Unintentional injury in childhood first appeared as a Labour policy priority in 1999 in the public health White Paper "Saving Lives: Our Healthier Nation"[2]. In 2003 child casualty rates from road traffic accidents were selected as a headline indicator to monitor progress towards the infant mortality and life expectancy targets which were set in "Tackling Health Inequalities: a programme for action"[4]. Five years later, the first cross-Government strategy for improving children and young people's safety was launched [118], which included a Public Service Agreement (PSA) goal to reduce hospital admissions from unintentional and deliberate injuries in children[118]. To date there has been no mention of unintentional injury in the new government's budget[265], programme for government[266] or the Conservative public health green paper published prior to the election[267]. However the publication of the coalition government public health White Paper later in 2010 should give an indication as to the level of priority childhood injury is likely to be given into the future.

A review of reviews, in Chapter 3, indicated that the majority of research (reported in reviews) has sought to explore the impact of interventions designed to reduce injury or risky behaviours. There was less research documented in reviews investigating the unintentional or indirect impact of wider social policies on unintentional injury, such childcare or housing improvement programmes. The reviews indicated that programmes to distribute free or low cost equipment, and parenting and group interventions to increase safety awareness lead to increased safety equipment use and other safety related behaviours[70;72;73;79;80;84], but not necessarily decreased injury rates[84]. The reviews rarely looked at differential effects and many studies focussed only on disadvantaged groups. Policy areas which, based on the review of reviews, were less well researched were: the home environment (including housing quality and safety equipment use), childcare, and community regeneration. The associations between unintentional injury and both the home environment and childcare were then explored, using data from the Millennium Cohort Study (Chapters 5-6).

Improving the quality of the home environment was an important plank in the Labour government's strategy to reduce inequalities in health and welfare, including childhood injury. Steps included improving the quality of social housing[4], the reduction of overcrowding[118;164], and the launch of a national home safety equipment scheme to provide low income families with free or low cost safety equipment and safety consultations[118]. As can be seen in Figure 10.1, the majority of these policies came into effect after the MCS children were in their preschool years (the period during which their risk of injury has been explored). However by comparing children who were exposed and unexposed to changes that may come about as a result of these policies, it has been possible to assess the potential impact on injury risk.

The new coalition government recently announced some changes in the emergency budget which could lead to changes in the quality of the home environment, for example from April 2011 housing benefits will be capped according to property size (ranging from £250 per week for a one bedroom flat to £400 per week for houses with four bedrooms or more)[265]. As of April 2012, those claiming Job Seekers Allowance will only be entitled to the full housing benefit entitlement for up to 12 months, after which it will be cut by 10%[265]. This could lead to families having to move into overcrowded and poorer quality housing[268].

The remainder of this section (10.2), reports findings surrounding the home environment and unintentional injury (Chapter 5) as part of the injury case study. Findings pertaining to childcare and injury (Chapter 6), the analysis which provided the overlap between the two case studies, are summarised alongside the other childcare analyses (Chapters 7-8), in section 10.3. Findings from both case studies are then synthesised together in section 10.4.

### *10.2.2 Trends and inequalities in injuries and the home environment*

Hospital Episode Statistics data indicate that approximately 1.6% of 1-3 year olds and 1.5% of infants are admitted to hospital for an injury every year. Whilst the older age group may have experienced a small decrease in admissions from injury over the past decade, rates for infants may be rising (although this may be in part due to changes in recording of maltreatment[126]). In the MCS 8% of infants (aged 9 months) had been taken to see a health professional since birth, and 0.5% had been hospitalised, as the result of an unintentional injury. At age 3 years 36% had been injured since the age of 9

months and 2% had been hospitalised due to an injury. The risk of injury (hospitalised or not) was socially distributed; between birth and 9 months infants of lone mothers were 23% more likely to have visited a doctor, health centre or hospital due to an injury than those living in couple families. Between the age of 9 months and 3 years children of lone mothers still had a higher risk than those from couple families, as did those whose mothers were from routine and manual classes (compared to managerial and professional groups), less educated (compared to those with a degree), or living in the most deprived fifth of areas in England (compared to those in the least deprived fifth). Elevated risks seen in the least advantaged compared to the most advantaged groups were in region of 20% for all measures of SECs.

Trend data on injuries to preschool children occurring in the home are not readily reported. However it is widely accepted that this is where the majority of injuries in this young age group occur. In the MCS 36% of children had been injured between 9 months and 3 years, and almost two third of these (22% in total) had experienced their most severe or only injury in the home. Injuries occurring in the home displayed slightly larger socio-economic inequalities than injuries occurring anywhere. For example the elevated risk seen in children whose mothers had no qualifications compared to those with a degree was 42% for injuries in the home (Chapter 5) and 14% for all injuries (Chapter 3); for routine and manual groups compared to managerial groups, the respective figures were 33% and 18%.

Data from the English House Conditions Survey (EHCS), and the General Household Survey (GHS) indicate that improvements to housing quality have occurred in recent decades, with a decrease in the proportion of households without central heating or smoke alarms (Chapter 5). The proportion of households living in flats however remained relatively stable, due to demographic changes and demands for smaller household units[269]. In the MCS the majority (65%) of families were living in homes with only one or no negative housing features (with negative housing features consisting of: living in a flat rather than a house, on higher storeys, without a garden, with damp or condensation, with fewer rooms per capita, and without central heating). Safety equipment use (smoke alarms, safety gates, electric socket covers, and fire guards) ranged from 31% for fire guards to 82% for smoke alarms, and only 7% of families had no safety equipment at all. All of these aspects of the home environment were socially distributed and were especially high for housing quality (for example families living in

the most deprived areas were five times as likely to not have access to a garden than those in the least deprived areas, and families living in socially rented properties were almost three times as likely to have damp or condensation that those who owned their own home).

### *10.2.3 Association between the home environment and inequalities in injury: findings from the MCS*

Few of the proxies for the home environment were individually associated with the risk of injury; however a housing score, taking into account all aspects of housing features collectively, was. Children living in households with two or more negative features were around 20% more likely to have been injured. When exploring the safety equipment score (consisting of the number of pieces of safety equipment used, out of a total of four) those with one, two or three pieces of equipment had a higher but non-significant risk of injury compared to those with four. However children living in households which used no safety equipment were 80% as likely to be injured compared to those with all four.

Since both injuries and aspects of the home environment were socially distributed, and because the home environment could potentially influence the risk of injury in the home, it was hypothesised that the home environment might lie on the causal pathway between SECs and injury. However, when controlling for the housing and safety equipment scores, the association between SECs and injuries occurring in the home was unchanged, implying that, in this instance, it did not lie on the causal pathway. However it is also possible that no change in the social distribution was observed due to co-linearity between the SECs and home environment measures, or because the proxy measures for the home environment were not sufficiently precise.

## 10.3 Childcare case study: summary of findings

### *10.3.1 Policy context for childcare, injury, breastfeeding, and overweight*

The first Labour government childcare strategy was implemented in 1998 as part of their policy to promote paid employment as a route out of poverty. Childcare tax credits for working families (with children under 11 years of age and being cared for in registered childcare), which were first introduced in 1994, were increased [135]; and a scheme to provide three-four year olds with 12.5 hours a week free early year's education for 33 weeks a year was announced[134]. In response to an inter-departmental

childcare review in 2002[136], a new childcare strategy was launched in 2004. Under this new ten-year strategy, the free early year's education entitlement for 3-4 year olds was increased from 33 to 38 weeks a year. Financial support towards childcare costs was increased through rises in tax credits in 2005 and 2006. A professional qualification for childcare staff was introduced and aims to have at least one graduate member of staff in each full-time childcare provider by 2015 were announced[270]. In September 2010 the number of free hours increased from 12.5 to 15 a week and two year olds living in deprived areas in England are also eligible[17].

According to the Conservative-Liberal Democrat coalition Budget, released in June 2010, the free childcare entitlement will be continued[265]. A recent call for evidence for a review of the Early Years Foundation Stage also implies that formal childcare will remain high on the new government's agenda[271]. However the new government recently published a number of options for welfare reform. These were out for consultation (at the time of thesis submission) and could lead to the Working Tax credits, including the childcare element, being subsumed into one benefit or abolished altogether[272].

The first sweep of data was collected in the MCS when the cohort members were aged 9 months, and this took place in 2000-02. Therefore the MCS families at that time would have been subject to the 1998 childcare strategy policies. There were very few schemes aimed specifically at infants under this strategy, although working families with infants were eligible for childcare tax credits. The second sweep of MCS interviews took place between September 2003 and January 2005 (see Figure 10.1), when the children were aged approximately 3 years. The new childcare strategy was introduced in December 2004 and so the MCS children are unlikely to have been affected by any changes that occurred as a result. Whilst uptake of the free places for 3-4 year olds under the 1998 strategy was around 90% [140], 11% of the MCS children were under 3 years (31-35 months) at the time of interview, and those who were 3 or more would not have been receiving statutory free childcare for very long (43% children were aged 36 months exactly). However, by comparing the health status of children who were looked after in different types of childcare to those who were looked after only by a parent it has been possible to explore the potential impact of past and potential changes to the childcare agenda. This is largely in relation to the potential implications of increases in informal or formal childcare uptake, for two age periods during the preschool years.

Evidence derived from the review of reviews in Chapter 4 indicated that the majority of research reported in reviews was surrounding the impact of formal childcare (often preschool education) on child health. Whilst there was some research investigating childcare use in relation to infectious disease, the main focus appeared to be on child development and educational readiness and long term outcomes such as employment and teenage pregnancy. There was a paucity of research exploring these relationships in different social groups[82] and also investigating the impact of informal childcare on child health[85;91]. Therefore in this thesis informal and formal childcare was explored separately in relation to unintentional injury (providing overlap with the injury case study), breastfeeding, and overweight, overall and in different socio-economic groups.

As discussed earlier (and in Chapter 3), the reduction of childhood unintentional injuries was a priority under the previous administration. Improving rates of breastfeeding and reducing childhood overweight and obesity were also priorities for the Labour government and both featured in the PSA to improve the health and wellbeing of children and young people[200]. Childhood obesity featured in the Conservative public health green paper prior to the election[267], but there has been no mention of injury or breastfeeding to date. It may be possible to better assess the level of importance assigned to these areas of health when the public health White Paper is released later this year.

### *10.3.2 Trends and inequalities in childcare, injury, breastfeeding and overweight*

Formal childcare use has increased over the past few decades in response to a number of societal trends including rises in lone parenthood and maternal employment[145], although the number of registered childminders have fallen[270] and trends in informal childcare are less clear[149]. Data from the Infant Feeding Survey show an increase in formal childcare between 2000 and 2005, although informal childcare remained relatively stable (Chapter 4). During 2000-02, half of MCS infants were regularly cared for by someone other than a parent (35% informal and 15% formal childcare) between birth and 9 months. For the period 2001-05, when they were aged between 9 months and 3 years, 60% were looked after in non-parental care. Formal childcare use had increased since the first sweep from 15% to 28% and there had been a slight decline in informal care from 35% to 31%. Formal childcare was particularly socially distributed in the MCS at both time points, and especially in infancy when, for example, 1.5% of mothers with no educational qualifications used formal childcare compared to 41% of mothers with a

degree (relative difference (RD)=0.04). Between the age of 9 months and 3 years, inequalities in formal childcare were less pronounced but still significant (for example mothers with no education qualifications were around a quarter as likely to use formal childcare than mothers with a degree [RD=0.26]).

As reported in section 10.2.2, 8% of infants had been injured in the MCS between birth and 9 months, and one third had been injured between 9 months and 3 years. The risk of injury was higher in less advantaged groups, particularly in the older age period.

Although according to the Infant Feeding Survey breastfeeding rates have increased the UK, the proportion of mothers breastfeeding for at least four months remains low at 34%. Similarly, in the MCS only 33% of mothers breastfed for the period of time recommended by the World Health Organisation and the Department of Health. Mothers from less advantaged backgrounds were significantly less likely to breastfeed than those from more advantaged backgrounds for all measures of SECs, with RDs in the region of 0.25-0.51 for the least advantaged groups (according to the four measures of SECs) compared to the most advantaged. Childcare use before the age of four months (and for at least 10 hours a week) was low (only 2% of mothers used formal childcare and 7% used informal childcare). Mothers from less advantaged groups were also less likely to use formal childcare before four months (with RDs as low as 0.10), although they were up to three times more likely to use informal childcare (compared to higher SEC groups) (Chapter 7).

Childhood overweight has increased dramatically in recent decades, and although recent data imply that prevalence is starting to level off, almost one quarter of children are overweight or obese by the time they reach school age. In the MCS 23% were overweight or obese by 3 years. Children from less advantaged backgrounds were slightly more likely to be overweight or obese at age 3 years than those from more advantaged backgrounds, in terms of relative and absolute differences, although only for some measures of SECs. For example children living in the most deprived areas were almost one fifth more likely to be overweight or obese compared to those living in the least deprived areas (relative difference (RD)=1.19 [1.04, 1.36]), with an absolute difference of 3.87% (0.96, 6.77). 24% of children were looked after in informal childcare for at least 10 hours a week between the age of 9 months and 3 years, and 22% were looked after in formal childcare. Those from less advantaged backgrounds

were consistently less likely to be looked after in formal childcare for all measures of SECs except for lone parenthood (with RDs in the range of 0.23 to 0.43 and absolute differences (AD) of -0.74% to -34.5%) and were up to twice as likely to be looked after only by a parent (when comparing mothers with no educational qualifications to those with a degree (RD=2.10 [1.95, 2.26], AD=40.33% [36.73, 43.92]). There were mixed patterns of informal childcare use (Chapter 8).

### *10.3.3 Association between childcare and inequalities in health: findings from the MCS*

Children who were looked after in informal childcare were 5% more likely to have been unintentionally injured (between 9 months and 3 years), half as likely to have been breastfed for at least four months, and 15% more likely to be overweight at age 3, compared to those who were looked after only by a parent. Informal childcare was not associated with injury risk between birth and age 9 months. Compared to those who were looked after only by a parent, children who were looked after in informal childcare were more likely (in the range of 9%-15%) to be injured between 9 months and 3 years if they were from less advantaged groups, and were between 18% and 42% more likely to be overweight if they were from more advantaged groups. The reduced rates of breastfeeding (of around 50%) in informal childcare were seen across all socio-economic strata.

Overall formal childcare use was not associated with injury risk between birth and 9 months or between 9 months and 3 years, nor was it associated with the risk of overweight. Infants who were looked after in formal childcare were 15% less likely to be breastfed for at least four months than those who were only looked after only by a parent. However when stratifying by SECs, some interesting associations emerged. Infants from less advantaged groups were up to twice as likely to be injured if they were looked after in formal childcare compared to those who were looked after only by a parent, whereas those from higher SEC groups were around a third less likely to be injured if they were looked after in formal childcare. There were no associations between formal childcare and injury in any strata between 9 months and 3 years. The reduced likelihood of breastfeeding was only observed in the more advantaged groups (with a reduction of approximately 25%) when stratifying by SECs, and lone mothers were 65% more likely to breastfeed if they used formal childcare. Children looked after

in formal childcare did not differ in terms of their risk of being overweight, compared to being looked after only by a parent, in any of the SECs strata.

## 10.4 Synthesis of findings in light of current and future policy

In this following section I speculate what the potential implications of policy changes that have occurred since the MCS data were collected might be, and also potential changes that may occur in the future. These are discussed according to a number of policy changes, shown in italic headings throughout the following section.

Table 10.1 provides a simple summary of how the relevant aspects of health would be affected (i.e. improve or worsen) by changes to the home environment and childcare use, and the potential impact on inequalities (i.e. whether inequalities would narrow or become wider). It does not take into account the size of effect or burden (for example using population attributable risk). The findings reported throughout this thesis are based on observational data and although it was possible to use longitudinal information and to adjust for a range of confounders, causation cannot be assumed. Furthermore the measures of childcare and the home environment are only proxies. The table is therefore designed to act as a framework to structure the synthesis and its content should be interpreted with caution.

*Table 10.1: Potential impact of policies for the early years on inequalities in health, assuming that associations observed are causal*

| | **POLICY** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **INCREASE CHILDCARE** | | | | **IMPROVE HOME ENVIRONMENT** | | | |
| **HEALTH** | **Informal** | | **Formal** | | **Housing quality** | | **Safety equipment** | |
| | *Overall* | *Inequalities* | *Overall* | *Inequalities* | *Overall* | *Inequalities* | *Overall* | *Inequalities* |
| **Injury 9 mths** | – | ↑ | – | ↑ | | | | |
| **Injury 3 yrs** | – | ↑ | – | – | – | – | – | – |
| **Breastfeeding** | ↓ | – | ↓ | ↓! | | | | |
| **Obesity** | ↑ | ↓! | – | – | | | | |

– No change to prevalence or inequalities; ↑ Increase in prevalence or inequalities; ↓ Decrease in prevalence or inequalities; ↓! Reduction in inequalities but as a result of worse outcomes in more advantaged groups ☐ Not applicable to the injury case study
— Childcare case study — Unintentional injury case study

*Improvements to the home environment*

As a result of the children and young people's safety action plan, safety equipment ownership will have increased in poorer households with young children. However findings from Chapter 5 imply that safety equipment use (of the types reported in the MCS) does not significantly decrease the risk of household injuries at a population level or alter its social gradient. The quality of housing has improved in recent years and may continue to (in some respects) due to schemes introduced under the Labour government, such as the national safety equipment scheme. However some aspects of housing quality may worsen for poorer groups, due to proposals by the new government to reduce housing benefits[265;268]. The characteristics, which were collected in the MCS, and used as proxy measures to represent housing (such as overcrowding, garden access and heating type), did not appear to influence inequalities in injuries in the home. This suggests that future changes to the home environment, such as changes in prevalence of overcrowding or homes without central heating, will not necessarily alter inequalities in childhood injuries at a national level. However specific items of safety equipment are likely to have benefits for certain types of injury in certain households and improvements to housing will be beneficial for those living in very poor housing (in the MCS the majority of households were rated positively). Furthermore, many other aspects of health and welfare are likely to be affected by changes to housing quality, not only for young children but all household members.

*Increases in formal childcare*

The 2004 childcare strategy aimed to encourage childcare use in children aged two years and above[17]. Extensions in maternity leave which occurred in 2003 and 2006 mean that mothers are currently entitled to nine months statutory maternity pay and a further three months unpaid leave. This may have reduced the proportion of very young infants being looked after in childcare[204]. However increases in the childcare element of the Families Working Tax Credit[17] may encourage mothers to return to work and place their infant or child in registered childcare (since credits are only provided to parents of preschool children if the childcare provider is registered in the Early Year Register, with the exception of nannies, who must register on the voluntary section).

Findings from other studies from outside the UK imply that, overall, formal childcare use is associated with a lower risk of injuries [190;191]. However analyses conducted as part

of this thesis (albeit with crude measures of childcare type) indicate that this may only be the case for infants from more advantaged backgrounds, and that that formal childcare may in fact be detrimental for those from less advantaged backgrounds (Chapter 6). More needs to be done to establish how these potential benefits observed in more advantaged groups can be achieved for all children. Formal childcare was also associated with a reduced likelihood of breastfeeding (Chapter 7) and these patterns have been observed in other studies[208-210;212]. However findings from this thesis imply that the reduced likelihood observed in formal childcare might only be occurring in more advantaged groups (who had highest rates of formal childcare use), whilst lone mothers using formal childcare were more likely to breastfeed. Formal childcare settings therefore may provide an opportunity to increase breastfeeding rates in groups of mothers who traditionally have low uptake (such as lone parents).

*'Formalisation' of informal childcare*

Changes to the childcare registration system (under the 2006 Childcare Act) meant that anyone who cared for a child (or in the case of home based care, children from more than two families), to whom they were not related, for more than two hours a day, and for which they received reward, had to become registered. Where the child is under the age of 5 years carers also had to register in the Early Years Register. Therefore there will have been a re-categorisation of some types of informal childcare and therefore potentially improvements in the quality of care received by children who, for example, were previously looked after by unregistered childminders. However registration does not lead to regulation for all childcare types, for example nannies are only able to register voluntarily because they provide home based care for children from no more than two families. Childcare providers registered on the voluntary register receive a Criminal Records Bureau (CRB) check, but are not regulated [196]. Furthermore, in the MCS, and according to other national level data [149;252;253], the majority of informal carers are grandparents, and relatives are exempt from registration. Therefore a large proportion of children will still be looked after in unregulated and unregistered childcare.

*Increases in informal childcare*

Despite the move to regulate some forms of informal childcare, and the provision of early year's education, it might be argued that the use of informal childcare is unlikely to decrease. Care by grandparents and other relatives is the most viable option for many

families now and potentially into the future. It is affordable and can provide flexible care which wraps-around the weekly free entitlement for 3-4 year olds. Care by grandparents has been referred to as the 'glue' which holds formal childcare arrangements together [256]; it is highly valued and trusted and often considered to be the best alternative to parental care[255].

Assuming the measure of childcare used in this thesis is representative of true childcare use and that the associations observed are causal (for purposes of debate only); an increase in informal childcare use could lead to a rise in unintentional injury rates (for toddlers), decreases in breastfeeding rates, and increases in overweight, at the population level. Only children from less advantaged backgrounds were at an elevated risk of injury if they were looked after in informal childcare and therefore increases in informal childcare could lead to a widening of inequalities in injuries. Whilst infants who were looked after in informal childcare were less likely to be breastfed regardless of their socio-economic circumstances, poorer groups are more likely to use informal childcare in early infancy and therefore increased uptake of informal childcare might lead to a widening in inequalities in breastfeeding rates. Children cared for in informal childcare were only more likely to be overweight if they were from more advantaged backgrounds, and this may lead to a narrowing of inequalities. However, as pointed out earlier, a narrowing of inequalities which occurs due to a decline in health in more advantaged groups is not considered appropriate.

It has not been possible to explore the characteristics of childcare (such as quality or cost) or many of the factors which might lie on the causal pathway between childcare and health (e.g. diet). The following two sections speculate what might happen if existing policies to improve the quality of childcare (through training and regulation) lead to improvements in quality (in areas which could potentially influence health), given the associations which have been explored throughout this thesis.

*Improvements in the quality of formal childcare through training*

Steps to improve the education and training of childcare staff were proposed by the former Labour administration under the 2004 childcare strategy. A training scheme was launched known as Early Years Professional Status (EYPS). In order to gain EYPS status 39 standards must be met, and these are organised into six groups: knowledge and understanding, effective practice, relationships with children, communicating and

working in partnership with families and carers, teamwork and collaboration, professional development[273]. Standards 5 and 19 focus on safety awareness and establishing safe environments to promote health, safety and physical, mental and emotional wellbeing. Standard 19 also states that Early Years Professionals "will promote healthy eating and regular exercise"[273](p44).

A target was set to ensure that every full childcare setting had at least one EYPS staff member by 2015, and that those in the most deprived areas have at least two[139]. Recent Ofsted data indicate that the qualifications of childcare workforce increased slightly between 2007 and 2009, although to date only 22% of childcare providers had at least one graduate, and only 4% in deprived areas had at least two[270]. Continued efforts to achieve this target may help to raise the standard of formal childcare attended by children from all social backgrounds. This carries the potential to reduce inequalities in health, for example in injuries occurring in infancy, although further research exploring this potential is required. Recent announcements indicate that the EYPS scheme will be supported under the new government[274].

*Improvements in the quality of formal childcare through regulation*

Since 2008, childcare providers which are registered with Ofsted are inspected within a short period of registration (but no more regularly than every three years thereafter if initially judged to be satisfactory). This system could lead to some improvements in quality and awareness amongst childcare professionals. There are 14 national standards which registered childcare providers must reach, including physical environment (premises are safe, secure and suitable for their purpose), safety (safety is promoted within the setting and proper precautions are taken to prevent accidents), health (good health is promoted and positive steps are taken to prevent the spread of infection), and food and drink (children must be provided with regular drinks and food in adequate quantities to their needs)[275]. The requirements within each standard vary according to childcare type, although generally are broad and often vague. For example the food and drink standard recommends that "food and drink is properly prepared, nutritious and complies with dietary and religious requirements", but makes no detailed recommendations about the nutritional content of snacks and meals and no reference to breastfeeding is made.

Whilst school caterers providing lunches for maintained nursery schools are subject to some standards, these are not as stringent as for primary and secondary schools. A review summarising the current food, nutrition and healthy eating guidance in England in early 2010, pointed out that these standards exclude all other childcare settings, are out of date, and do not apply to food provided outside lunchtime[276]. Guidance exists for diet, physical activity and breastfeeding[240;277], but awareness of their existence is low. The review of healthy eating guidance in England concluded that there is a need for more comprehensive and detailed guidance that can be easily accessed and applied in all early years settings in England[276].

It was not possible to investigative the characteristics of childcare. Given recent increases in childcare use and the likelihood of this trend continuing, childcare settings offer a potential mechanism for promoting breastfeeding. This might be achieved through changes to nutritional guidance and regulation in formal childcare settings. Support from the EYPS scheme could strengthen this potential for change further. However the reduced likelihood of breastfeeding in infants cared for in formal childcare was stronger in more advantaged groups. Therefore this group may benefit more from improvements to breastfeeding policies in formal childcare than those from less advantaged backgrounds, which could lead to inequalities in breastfeeding widening further. Although formal childcare was not associated with overweight, increased physical activity and healthier food in childcare will have a wide range of other health benefits.

## 10.5 Comparison with other findings

Reviews of research are considered to be a better basis for informing policy than a single study[112], for example through piecing together a range of information to form a "jigsaw of evidence"[41]. Syntheses, defined as "the process of bringing together the results of individual research studies in order to better map the knowledge base" [112](pg S1:1), can be used to bring together the jigsaw pieces. Syntheses have been referred to as a new science[112], although several methods for synthesising information have or are being developed. The most cited type of synthesis is typically considered to be a review which employs systematic review methodology but includes observational and qualitative study designs alongside traditional experimental evidence[113]. However it has been pointed out that in using such a rigorous systematic approach for evidence synthesis, the methods become too technical and dependent upon the style and

interpretation of the authors, and that therefore policy makers are unable to interpret findings independently[112]. Alternative approaches for synthesising evidence include narrative syntheses drawing together information and analyses from a range of sources and discussing them in a structured way, for example a study exploring the impact of welfare policies on the health of lone parents synthesised information on the policy context in Sweden and the UK and secondary data in trends and associations, using a conceptual framework "for studying the health impact of social position and social context".[44](p256). Alternatively, the "Prevent model" is a simulation model which was developed for use by policy makers to estimate the effects of changes in risk factors on mortality. It is based on the 'potential impact fraction' (which is a multi-factorial equivalent of the attributable fraction), and takes into account multiple risk factors and diseases, over time, and allowing for demographic characteristics [278]. A recent report used a combination of narrative synthesis and micro-simulation to investigate child poverty in the UK. Hirsch, the author, firstly documented the extent of the problem through presenting trends and levels of child poverty, discussed policies which might alter child poverty, and summarised how policies had influenced child poverty to date. He then combined this information to forecast how child poverty might change in the future, using micro-simulation [6].

This chapter has synthesised findings derived from reviews, policy documents, and secondary data pertaining to trends, inequalities and associations from several sources, using a narrative approach. A quantitative approach, such as the "Prevent model", might have been used to synthesise the findings from secondary datasets, by estimating changes in injuries, breastfeeding and overweight, given arbitrary changes (which might be guided by past trends or policy intentions) in childcare use and the home environment. However information derived from a range of other sources (such as policy documents), which are not compatible with quantitative synthesis, have also been used. Furthermore the majority of the secondary data used throughout this thesis have been derived from samples, and therefore estimates of prevalence, inequalities, and the associations between policies and health, have margins of error (or confidence intervals), and these would have become augmented when used in combination. Finally, the associations observed in the MCS are based on observational data, and since causality cannot be proven, it is possible that changes in the exposure would not necessarily lead to equivalent changes in health observed in the regression models. Therefore the decision was taken not to implement a quantitative approach, but to use a

structured, narrative approach. Assumptions about causality still had to be made in order to facilitate discussion; in Chapter 11 the use of secondary data for exploring associations and inferring causality is discussed.

## 10.6 Strengths and limitations

This synthesis has used evidence from secondary data analyses reported in Chapters 3 to 8. There are a range of strengths and limitations related to the MCS and to the individual analyses, and these are reported in the relevant chapters. Here, only the strengths and limitations related to synthesising this information and its use in informing policy are considered.

The two main exposures explored in this thesis are the home environment (taken to be housing and safety equipment use) and childcare; these can only be considered proxy measures and both are likely to experience within-group heterogeneity. For example many children are looked after in several different types of childcare either in parallel or over time, and there are many types of childcare falling into the categories 'informal' and 'formal'. Whilst the measures of SECs applied are standard, these too can only be regarded as proxies for what they are designed to represent and are likely to heterogonous (this particularly applies to NS-SEC where the most condensed three-category version was used[102]). The analyses conducted in this thesis cannot capture these complexities and it is possible that some of the associations observed are confounded by these limitations (for example differential patterns seen for injury risk in infants looked after in formal childcare may be because more affluent groups use different types of formal childcare than those from less affluent groups).

Analyses have been conducted using data from the MCS, a cohort of children born in the UK in 2000-02. This is the most current UK-wide cohort appropriate for these analyses, although it is likely that the experiences of today's preschool children are different. For example the proportion of infants cared for in childcare for four months may have fallen as consequence of extensions in maternity leave. However the recommended period of breastfeeding has also been extended to six months. The MCS children were preschool age under the 1998 childcare strategy, and so it was possible to assess the potential impact of childcare before the new childcare strategy changes were implemented. This information can also be used to contemplate the potential effects of subsequent changes. Findings presented in this thesis may be a useful comparator for

future cohorts, such as the proposed 2012 cohort[279], who will be exposed to different policies.

The policy context relevant to the MCS children was established using policy documents and articles sourced from government websites and relevant "think tanks" such as the Day Care Trust and the Royal Society for the Prevention of Accidents (RoSPA). A limitation of this thesis has been its timing. The new Conservative-Liberal Democrat coalition government came into power in May 2010, towards the completion of the project. Attempts have been made to take into account potential changes using pre-election documents such as the Conservative public health green paper[267] and coalition publications such as the coalition programme for government[266], the 2010 Emergency Budget[265] and recent consultation documents published by the new government [271;272] However these cannot provide a complete picture, and to date only a small amount of information pertaining to childcare has been released and virtually nothing for unintentional injury. Many more policy changes will occur in the near future and these cannot be anticipated through the content of these reports. However the methods used in this thesis might be applied in light of future policy changes.

The work with the PEAR group (presented in Chapter 9) was not designed to be a piece of qualitative research but a means to involve young people in research and therefore could not be incorporated into the synthesis. It might be argued that the time spent preparing for, and running, the sessions with the young people could have been spent conducting another secondary data analysis or a more in depth review which could have acted as another 'jigsaw piece' and been used in the synthesis.

A simple, narrative approach has been used to synthesise findings from this thesis, as opposed to quantifying net effects. This approach was chosen so that it may be easily interpreted and transferred into areas of policy making and practice; and also to avoid amplifying the shortcomings of the data in each of the individual analyses. However it was possible to explore combined effects in some instances. For example, patterns observed in the breastfeeding and overweight analyses indicated that breastfeeding potentially lay on the causal pathway between childcare and overweight and this possibility was investigated in Chapter 8.

The focus in this thesis has been skewed slightly more towards the childcare case study, and only two policy areas were explored in relation to injuries. Had there been more time it would have been valuable to explore other areas requiring further research in relation to injury, such as parenting and supervision. This would have provided a more complete picture of what influences childhood injuries, and it is possible to explore some of these factors using the MCS. Although greater emphasis has been placed on childcare in this thesis, it was possible to explore only three aspects of child health in relation to childcare. Whilst these were chosen for being less well researched and of high government priority, there are other areas which still require further research in relation to childcare, such as maternal wellbeing. These are also areas which could potentially be explored in the MCS.

The evidence from the reviews rarely took into account inequalities. The relationships presented are based on observational data over relatively short periods of time. It was therefore not possible to determine whether the associations we have seen between childcare and health, overall and in different SEC groups, are explained by childcare use or residual confounding. Due to the young age of the cohort the three analyses were also unable to investigate longer-term impacts of childcare on health.

Unfortunately it was not possible to assess childcare quality in the MCS. Uptake of the free early education places was almost universal in England when the MCS children were age 3 [17]. Ofsted data showed that quality was good and improving [280], although quality tended to be higher in less deprived areas[132]. The provision of free places holds the potential to equalise the quality of childcare received by children from different SECs, however it was not possible to isolate the impact of these free places in this thesis, since at the second sweep only a small proportion of children would have potentially been attending childcare for a substantial length of time (only 6% would have been eligible for six months or more). Furthermore it has not been possible to isolate the impact of childcare at particular ages, due to the way in which the data were collected. This might be useful for exploring the potential impact, for example, of the free early years education places which became available to 2 year olds living in deprived areas in 2009.

## 10.7 Summary of findings

- In this chapter findings presented throughout this thesis have been synthesised in light of the policy context experienced by the MCS children.
- Some attempts have been made to assess the potential impact of policies under the new coalition government, although a complete picture cannot be provided so early on in the administration.
- Findings from this thesis indicate that unintentional injury rates in young children remain high and socially distributed.
- Childcare use has increased and is likely to continue to rise; currently children from more advantaged backgrounds are more likely to be looked after in formal childcare, although policies under the previous and current government have the potential to change this.
- Potential changes to the home environment, such as increased home safety equipment use or improved housing quality, may not have any effect on inequalities in injuries.
- Increases in childcare might inadvertently widen inequalities in injury in infants and young children, and may also have a detrimental impact on breastfeeding rates and levels of overweight and obesity (although sometimes more so in more advantaged families). Steps to improve quality for all groups, for example through training and guidance, could alleviate this.

The following chapter (Chapter 11) presents the final discussion chapter for this thesis.

# 11 Chapter 11 – Discussion

This chapter presents the final discussion for this thesis. A summary of findings is not provided, because this is laid out in the previous synthesis chapter (Chapter 10). Firstly I summarise what this thesis adds to the methodology, research and policy knowledge base and then go on to discuss overarching strengths and limitations (strengths and limitations for specific datasets and analyses have been discussed in detail in the relevant chapters). Finally, I make recommendations for further research, and highlight some overarching implications for policy and practice.

## 11.1 What this thesis adds

This thesis aimed to explore how policies for the early years might influence inequalities in health, using the examples of unintentional injury and childcare, and taking what might be seen as a rather unconventional approach. Government initiatives are typically set up in ways that make it difficult to estimate overall effects of policies or policy areas on health inequalities using experimental designs[34]. This thesis illustrates the potential usefulness that existing evidence from reviews, policy documents and secondary data analysis have for contributing to the jigsaw of evidence. The broad question of how policies might influence inequalities in health, and how one might go about researching this issue, is itself under-explored. In addition to this, the two examples used to answer this question were identified as high government priority and less well researched (in Chapter 2), and the specific analyses explored within the two case studies were also identified as being under-explored in two scoping reviews (Chapters 3 and 4).

Findings from Chapter 5 indicated that whilst housing characteristics (build type, storey, rooms per capita, central heating, damp and garden access) and safety equipment use (fire guards, safety gates, electric socket covers and smoke alarms) were socially distributed, not all of these characteristics were associated with the risk of injuries in the home and they did not explain inequalities in injuries occurring in the home between the ages of 9 months and 3 years. To my knowledge this is the first study to explore this at the individual level.

In Chapter 6, the association between main childcare use and injuries (occurring anywhere) was explored, for the first time in the UK and in different social groups.

Whilst there was no association in the overall analyses between childcare and injuries, differential effects were seen when stratifying by SECs, with the least advantaged groups faring worst. Concurrent with findings from a small number of studies, both informal and formal childcare use before the age of 4 months was associated with a lower likelihood of breastfeeding. However exploring the association in different social strata (which to my knowledge is the first time this has been done) indicated that the reduced likelihood of breastfeeding in formal childcare was only present in more advantaged groups. In addition to this, some groups with typically low breastfeeding rates, such as lone mothers, were more likely to breastfeed if they used formal childcare, when compared to lone mothers using no childcare. Similarly, whilst informal childcare use between 9 months and 3 years was associated with an increased risk of overweight (which has also been found in studies based in the US), the elevated risk only appeared to hold in more advantaged groups when stratifying. This thesis therefore not only adds to the evidence base regarding childcare and child health in the UK, but also demonstrates the importance of exploring relationships in different social strata, something which is rarely carried out.

Although to my knowledge no other study has synthesised the types of information presented throughout this thesis for injury and childcare, a number of techniques have been used to synthesise evidence in other areas of public health research[6;44]. This thesis has used a unique combination of reviews, policy documents, cross-sectional and longitudinal data. Not only might this approach be replicated for other areas of policy making and health, but the findings from this project might be used to forecast potential scenarios in light of future policy changes.

## 11.2 Strengths and limitations

Strengths and limitations of the methods and data used throughout this thesis have been discussed in the relevant chapters (3.2.5; 4.2.5; 5.5.2; 6.5.2; 7.5.2; 8.5.2). The overarching strengths and limitations are now discussed.

### *11.2.1 Thesis scope*

Two case studies were chosen as the focus of the thesis, and efforts were made to identify case studies which would be of use to policy makers, feasible within the three-year time-frame, and that would add to current knowledge (as outlined in Chapter 2). This approach is not commonly used in policy or research and might be considered

unconventional. Furthermore it took up a relatively large portion of time (approximately four months) which could have instead been spent conducting an additional analysis in the MCS, for example. However it has been noted that the bridge between science and policy making requires strengthening if research is to be used to inform policy[42]. Whilst improving access to primary and secondary evidence and a better understanding of how research is used by policymakers could help achieve this [42], the extent to which the responsibility to build this bridge should fall with policymakers or researchers is not entirely clear. The process used in this thesis to choose the two case studies might therefore be used as a basis for developing more formal procedures for identifying policy relevant research questions. If repeated, the process used to identify the case studies might lead to different choices. However the aim was not for the decision to be repeatable but to maximise relevance and feasibility, factors which may not always be clear if not using a formal system for assessment.

The analyses reported in Chapters 5 to 8 were driven by what was lacking in the reviews. This was established using scoping review methodology, which is designed to rapidly map the extent, range and nature of research activity in broad research areas[67]. Many of the reviews identified focussed on randomised control trials rather than observational studies, and therefore it is possible that areas highlighted as requiring further research may have in fact have just been lacking in terms of experimental evidence. However, when conducting literature searches for each of the less well researched areas which were explored with MCS data (in Chapters 5-8), it was clear that these areas were under-researched, with only a handful of studies exploring these areas, typically conducted outside the UK, and rarely looking at differential effects. With more time and resource, formal systematic reviews or meta-analyses could have been conducted and used to contribute more formally to the 'jigsaw of evidence' in addition to highlighting research gaps.

The areas explored using secondary analyses were limited by the availability of data in the MCS and also time constraints. For the childcare case study only three aspects of child health were analysed. Whilst these concentrated on areas of health that are of high government priority, there are other areas which still require further research in relation to childcare, such as maternal wellbeing. Due to the young age of the cohort, the three analyses were also unable to investigate longer-term impacts of childcare on health, and similar limitations are observed for the injury case study. Only two policy areas were

explored in relation to injury, although a range of proxies for housing quality and several types of safety equipment were explored under the remit of the home environment. Other areas identified as requiring further research include community regeneration and parenting style/supervision.

Participation in research and other matters carries considerable benefit to young people. The sessions with the young person's reference group, PEAR, were not intended to be pieces of qualitative research but a way to engage young people in public health research and hear their views, towards the beginning and end of the project. Given the amount of work required to plan and run these sessions, and the fact that the group's ideas tended to concur with the literature and our discussions within the project team, it might be argued that the efforts may have been better spent in strengthening the scoping review or conducting additional analyses with secondary data. However, in addition to the benefits to the young people from being involved, the materials and methods used might provide a base for future work, and make a small contribution to the culture of change that is required to increase young people's involvement in research. Discussions with young children or carers would also have added value, however this was not possible within this programme of work.

### *11.2.2 Timing*

The work presented throughout this thesis was largely completed during the Labour administration of 1997-2010 and so was guided by policies of that time. However in May 2010 a new Conservative-Liberal Democrat coalition came into power. Attempts have been made to take into account potential changes that may occur as a result of the new government, using pre-election documents, the 2010 Emergency Budget[265], and recent coalition publications and consultation documents. However to date only a small amount of information pertaining to childcare has been released and virtually nothing for unintentional injury. Although inevitably changes will occur in the near future which cannot be anticipated, the approach used in this thesis could be applied in light of future policies.

The MCS is the most current UK-wide cohort appropriate for the analyses presented in Chapters 5 to 8, although it is likely that the experiences of today's preschool children have changed since then. However because the MCS children were preschool age under the 1998 childcare strategy, it has been possible to assess the impact of childcare before

the new childcare strategy was implemented, and to use this information to contemplate the potential effects of subsequent changes. These findings may make a useful comparator for future cohorts, such as the proposed 2012 cohort[279].

### *11.2.3 Use of secondary data*

Secondary data provide a convenient and efficient resource, enabling the investigation of a variety of different exposures and outcomes[281]and are often the best option for exploring large scale interventions or policy areas where experimental studies are not feasible or ethical[39]. However the study designs and the questions used to capture information were not designed to address the aims and objectives of this thesis, and were often designed some time ago. Large scale surveys often exclude families who do not live in private households. They are also less likely to capture families who are more residentially mobile or from more deprived backgrounds, and this is a particular problem for cohort studies where attrition between sweeps is usually biased[282]. However sample and response weights were employed in the majority of the datasets explored in this thesis (including the MCS), and a recent paper exploring non-response in the MCS concluded that whilst those families who were lost to follow-up were different from those who were not, they were not "substantially different"[283](p333). The range of socio-economic information collected in the MCS and the oversampling of families from less advantaged areas provided sufficient information and statistical power to explore associations for different social groups using a range of socio-economic measures.

Although large surveys collect data in a standardised manner to allow for comparisons over time or across countries[281], in the majority of cases data from the different secondary datasets used in this thesis were not directly comparable. This is because they referred to different age groups or different countries, had different sample sizes, or because the questions were asked differently. Whilst the data from the other national datasets were not as detailed as in the MCS, they enabled trends over time to be explored, information which cohorts cannot provide. Because socio-economic measures available in the other national datasets were inconsistent between surveys and over time, and due to relatively small sample sizes, trends in inequalities have not been presented in this thesis. The majority of the information used throughout this thesis was based on parental recall (although over relatively short periods), with the exception of Hospital Episode Statistics for unintentional injury, and overweight in the MCS and the Health

Survey for England (HSE) (which were objective measures based on heights and weights and measured by trained interviewers). The limitations of maternal recall specific to each measure have been discussed in previous chapters (3.2.5; 4.2.5; 5.5.2; 7.5.2). A final strength of cohort studies, is that questions can be asked retrospectively if current thinking around a topic changes, or if the wording of questions does not capture what was intended when carried out in the field. For example, it was pointed out that the childcare questions in the second sweep of the MCS survey may have underestimated preschool attendance due to the way in which the questions were worded and so a retrospective question was used at the third sweep (age 5 years). These longer periods of recall are likely to carry limitations and so it was decided not to use this additional information (this was raised in Chapter 4 and discussed in Appendix 4). Although the associations between childcare and health observed in this thesis are likely to be unaffected a minimal amount (see Appendix 4), formal childcare between the age of 9 months and 3 years may be underestimated in this thesis as a result.

### *11.2.4 Using secondary data for exploring associations*

The associations demonstrated in Chapters 5 to 8 using data from the MCS are based on observational data. Several criteria were laid out by Bradford Hill in 1965 to consider when interpreting epidemiological associations and whether they imply causation[284]and several of these can be used to assess findings from observational datasets[281]. Bradford Hill firstly discussed the importance of effect size. He argued that associations demonstrating larger effect sizes might be considered to indicate causation more so than smaller effect sizes, although he also emphasised that modest effects sizes should not be taken as grounds for dismissal of causation. Effect sizes were relatively small in many of the MCS analyses, for example children who were looked after in informal childcare were 15% more likely to be overweight or obese than those only looked after by a parent (after adjustment and with 95% confidence intervals of 1.04 to 1.27). However the size of the risk ratios were often similar to those seen according to SECs (and therefore might not be considered unimportant). For example children whose mothers had no qualifications were 18% more likely to overweight or obese compared to those whose mother had a degree (1.02, 1.37), and those living in the most deprived areas were 19% more likely to be overweight or obese than those living in the least deprived areas (1.04, 1.36). In addition to this, associations between childcare and health were often augmented when stratifying by SECs. For example whilst infants looked after in formal childcare did not vary in their risk of injury (compared to those looked after only

by a parent) overall, those whose mothers were from routine and manual backgrounds were 46% more likely to be injured if they were looked after in formal childcare after adjusting for confounders (1.01, 2.12), and those from managerial and professional backgrounds were 34% less likely to have been injured (0.50, 0.89). Further to this, effect sizes should not be considered in isolation from the distribution of the exposure at the population level. For example whilst informal childcare between 9 months and 3 years was associated with a small increased risk of overweight, informal childcare at this age is reasonably common (almost one quarter of mothers reported using informal childcare for at least 10 hours a week). Conversely, whilst very few lone mothers used formal childcare in infancy, they were 1.65 (1.04, 2.63) times more likely to breastfeed than lone mothers who did not use childcare. Formal childcare may therefore offer a potential setting for breastfeeding promotion in this group.

The MCS analyses concentrated on areas which were less well researched and so there is limited existing evidence which can be used to assess the second of the Bradford Hill criteria "consistency". However findings which do exist, usually from outside the UK, typically found similar associations to those reported here for the MCS. However, virtually none of these studies explored the relationships in different socio-economic groups, although a few studies have explored and found differential effects for childcare in relation to other aspects of child health and wellbeing, such as school readiness and behavioural problems[285;286]. The differential effects observed in the MCS analyses tended to be seen in a number of socio-economic groups, perhaps indicating some degree of consistency. However further research into this area is required to explore whether the differential effects observed throughout this thesis are found in other studies.

The associations observed in the MCS analyses remained (and on the whole were largely unchanged) after controlling for a number of potential confounding factors. Regardless, it remains possible that the associations are explained by some other unknown or unmeasured factor(s). A number of sensitivity analyses were conducted for each analysis and are presented in the corresponding appendices.

Bradford Hill also pointed out that plausibility and temporality should be considered when assessing associations. The possibility that childcare might influence health, and that the home environment might impact on injuries occurring in the home, are both

plausible hypotheses, and in many cases it was possible to look at these associations over time, thus ensuring that the exposure preceded the outcome. Specificity is also highlighted by Bradford Hill. It has been pointed out that there is often long causal pathways between policies and health, perhaps with many intermediary steps[39], and this is potentially the case for the areas explored in this thesis (and particularly so for the analysis exploring childcare and injuries occurring anywhere in Chapter 6). Findings from Chapter 8 indicated that breastfeeding does not lie on the causal pathway between childcare use and overweight, and the home environment was not found to mediate the association between socio-economic circumstances and injuries occurring in the home. Further research exploring other potential factors, which might lie on the causal pathways between childcare and health (such as childcare quality) and between policies and injury (such as parental supervision), could help to further investigate the associations observed in this thesis.

### *11.2.5 Method of analysis*

Relatively simple methods of analysis were used in Phase 2 to allow policy makers to easily interpret findings and potentially translate them into practice. However a number of more complex techniques might have been used. Path analysis allows for greater levels of complexity than multiple regression[287], where, for example, there may be mediating variables or a number of exposure variables acting through different pathways to the outcome of interest (which is often the case when exploring policy influences on health[39]). Path analysis can also be used to explore which of a number of models best fit the data [287]. Potential mediating variables for several relationships were considered in this thesis where there were a priori hypotheses to indicate that they might exist. In Chapter 5 the home environment was explored as a mediator between SECs and injuries, and in Chapter 8 breastfeeding was considered as lying on the causal pathways between childcare use and the risk of overweight. More complicated path analyses might be conducted in future research to investigate other potential mediators (such as childcare quality or parental supervision) and multiple pathways, thereby providing further insight into the associations observed. The use of instrumental variables could have been used to establish whether the associations observed in this thesis are causal. An instrumental variable is some factor which can only be associated with the outcome of interest via the exposure of interest, for example one might argue that the Childcare Act could only influence child health via its influence on childcare. If the Childcare Act could somehow be linked to changes in child health then this could

support an association between childcare and health. However identifying instrumental variables can be difficult in the real world, and even then can often only be used to perform sensitivity analyses due to limitations (for example instrumental variables might be associated with unmeasured confounders in the same way that the main exposure variable is)[288]. The analyses in Chapters 6 to 8, which explored the association between childcare and health, were stratified by four measures of SECs due to an a priori hypothesis that the relationship between childcare and health might vary according to measures of advantage. For this reason interactions were not tested for, and the presence of statistically significant interactions were not considered to be a condition for stratification. Because stratification was carried out regardless of whether effect modification was occurring, the analyses can be used only to highlight groups where an association was observed (and does not allow comparisons of the association between the different strata). By repeating these associations in a number of strata a risk of over-testing is introduced, whereby the chance of detecting false positives (associations which appear to be statistically significant but are in fact spurious). Whilst attempts have been made to detect common patterns across the different strata rather than highlighting every individual significant association, the potential for false positives must still be acknowledged. It is also possible that differing patterns observed by SECs are in fact explained by the heterogeneity within the measures of childcare and SECs, as discussed in Chapter 10.

Multi-level modelling is an extension of ordinary regression which is used when data have a hierarchical structure [289]. Examples of when it might be employed include when trying to establish the extent to which area-level effects are explained by the characteristics of individuals who live within them, to incorporate the correlations between repeated measures from the same individuals, or to allow for clustering of children within households. The analyses presented throughout this thesis only included singleton children and therefore there was no clustering of children at the household level, although hierarchical modelling might be considered an appropriate technique for the analyses which used quintiles of area deprivation either as an exposure (in Chapter 5) or when being used to stratify (Chapters 6 to 8). However since areas are often targeted and monitored by policymakers for practical reasons, one might not necessarily be interested in area level effects independent of individual characteristics, but the overall effects at the population level. Despite this, the MCS employed a stratified (by area deprivation) and clustered (by region and ward) sampling design[93], and therefore

the sample weights are likely to account for the clustering of individuals within areas to some extent.

Missing data poses a problem in survey data, particularly if it is longitudinal. Data can be missing 'completely at random' (where there are no systematic differences between the missing and observed values)[290], in which case power will be reduced but the data will not be biased. However data which is completely missing at random is rare, and is more often either 'missing at random' (whereby systematic differences between the missing and observed data can be explained by characteristics measured in the observed data), or 'missing not at random' whereby differences between the missing and observed data cannot be explained even after the observed data have been taken into account[290]. There are a number of ways to deal with data which is missing at random. For example by including characteristics which are associated with an outcome being missing as covariates in a statistical model[290]. Response weights might also be produced, as they have been for the MCS, using baseline characteristics which predict missingness at later sweeps[283]. Another useful method for dealing with missing data is multiple imputation, whereby multiple versions of a dataset are created with the missing data assigned with randomly imputed values, using variables which are associated with missingness. The association is then explored in these imputed datasets to produce an average estimate[290]. It has not been used in this thesis due to the availability of response weights and the relatively low levels of missing data. However multiple imputation is likely to prove useful for future sweeps of the MCS as attrition inevitably increases.

## 11.3 Recommendations for future research

Whilst the analyses in Chapters 5 to 8 concentrated on areas of health and policy that are of high government priority, there are other areas which still require further research. For example, research investigating maternal and child wellbeing in relation to childcare use would be valuable. This may require the development of composite measures, for example for child wellbeing. Areas which were highlighted as requiring further research in relation to injury include community regeneration and parental supervision. There is also scope for exploring differential effects in the areas which were covered in the reviews for both the childcare and injury case studies, for example between childcare and child development, or parenting interventions and unintentional injury. More complex models might also be developed using pathway analysis.

Unintentional injuries remain the most frequent and socially distributed cause of mortality and morbidity in the UK and findings from Hospital Episode Statistics (HES) imply that rates in infants may have risen in recent years. Analyses presented in Chapter 5 imply that one area of government policy (housing) may not influence injury rates and their social distribution, as intended. However this is not to say that improvements to housing will not benefit other aspects of health and wellbeing, in children and other household members. Furthermore the measures utilised in this analysis only act as proxies for the true home environment and so further research into this area, using more specific measures, would be valuable; as would work exploring other potential mediators such as psychosocial factors. Qualitative research ought to explore why alterations to housing or safety equipment may not be having the desired effect at the population level.

Childcare settings have the potential to provide safe and healthy environments for children, influencing injury risk, diet and activity levels, and offering opportunity for health promotion. Given the rise in childcare use in recent decades and the government's drive to increase uptake further, understanding the association between childcare and children's health is imperative. Analyses reported in this thesis imply that childcare does have the potential to influence inequalities. In some cases childcare appeared to have the potential to reduce inequalities in health (for example in overweight), although by reducing the health of children from higher SEC groups, and this should be avoided. However formal childcare was seen to have a protective effect on some measures of health in particular groups (for example injuries in infants from advantaged backgrounds, or breastfeeding in lone mothers). Further research is required, ideally with more precise measures of childcare, to see if these differential effects are repeated and if so, to ascertain how childcare can be beneficial for all groups. Exploring why associations differed for different measures of SECs might also shed some light on this. Future research should also investigate longer-term impacts of childcare on physical health, and qualitative research to understand the experiences of carers and parents is necessary.

Other types of information that could be used to contribute to the "jigsaw of evidence" include systematic reviews or meta analyses. Qualitative research, could be used, for example to explore how informal care can be supported in ways which are sensitive to children's developmental needs, as well as the needs of those of other family members,

and gaining insight into the experiences of parents whose young children who have been injured in the home. International comparisons between countries with different policy contexts might also help to understand the associations observed in this thesis. The change in government could provide a potential natural experiment as policies change, for example planned reductions in housing benefits may affect housing quality for poorer groups into the future.

The approach used in this thesis might be replicated for other areas of policy making and health, and the findings from this project might be used to forecast potential scenarios in light of future policy changes. The approach used could be developed further, for example the evidence from the reviews was of limited use because they rarely reported differential effects by SECs. Future studies taking this approach would need to primarily conduct secondary data analysis, or interrogate the studies from the reviews in a different way, for example through contacting the review authors or revisiting the individual papers (bearing in mind it is likely that many of the studies do not explore differential effects) [34].

Currently there is only one UK-wide cohort, the MCS, which can be used to explore contemporary health issues for young children, and the next is not expected until 2012[279]. Steps need to be taken to reduce the dependency of research on single cohorts, for example through the collection of socio-demographic data alongside routine health data, improved data linkage between data sources, or the creation of synthetic cohorts sampled from routine datasets. The replication of findings and comparisons across countries in existing and planned datasets requires a system which supports data-sharing and knowledge[291].

## 11.4 Implications for policy and practice

Implications for policy and practice have been discussed in each of the relevant chapters, and so only the main implications are discussed here. Historically, housing improvements have contributed to health and life expectancy gains[292], and it was first pointed out by Dr DeHaven in the 1940s that increased resilience to injury risk (for example through education) cannot prevent injury if the inherent environment poses risks[293]. Therefore the lack of an association between the measures used to represent the home environment and injuries in the home found in Chapter 5 may be due to a threshold of safety having been reached in the home environments of the majority of

dwellings in the UK. Further reductions in childhood injury might well be achieved through interventions to increase resilience, for exampling through raising risk awareness, reducing maternal depression or improving levels of social support. However this is not to say that housing should be placed lower down on the policy agenda. Efforts to continue improving housing will benefit many other aspects of health and wellbeing, and particular attention should be paid to the social housing sector as the UK enters a period of economic austerity. As children are spending increasingly longer periods outside their family home, population level approaches to improve housing would be likely to benefit children as well as other household members.

The profile of childcare was raised substantially under the Labour administration, as a means to encourage parents to return to paid employment and to level up educational outcomes between the rich and poor. It appears to remain a priority for the new coalition government. However opportunities for improving child health are being missed, for example food provision in childcare centres might be regulated and existing guidance could be better utilised. Policy documents, initiatives and interventions to improve child health and wellbeing have traditionally focussed on the role of parents, schools and peers[147], informal childcare has received less attention and the role of grandparents in particular has been overlooked. Joined up working between government departments and other bodies could help in maximising opportunities to promote child health in childcare.

The focus of childcare policy to date has largely been on early years education and other formal childcare types, and although some informal carers (such as childminders) are now required to register on the Early Years Register, many (for example grandparents) are exempt. Informal childcare (and particularly care by grandparents) provides an affordable alternative to formal childcare that can easily wraparound the free entitlement of early years education, and is highly valued and trusted by parents[252]. This has been acknowledged in a document updating and building upon the 10 year childcare strategy "Next steps for early learning and childcare"[294]. More support and advice needs to be made available to support grandparents, who are often single, in employment, or on low incomes[146], in their childcare role. Many existing interventions might be targeted at grandparents, for example it has been suggested that children's centres could offer more support for grandparents[294]. New interventions tailored to the needs of

grandparents might also be beneficial; a recent example includes the launch of a website offering information, advice and support for grandparents[295].

## 11.5 Concluding remarks

Children from less advantaged backgrounds consistently suffer from worse health than those from more advantaged backgrounds. This thesis aimed to explore how government policies might influence inequalities in child health, utilising existing evidence and observational data, and focussing on the examples of unintentional injury and childcare. In doing so, the complexities of considering policy impacts on health inequalities have been demonstrated. The multi-factorial impact of policies on varying aspects of health, and the differential associations observed according to socio-economic circumstances, highlights the need for joined up working between all government departments, professionals, academics and other relevant bodies.

*"There is a lot we do not know about exactly why children from some backgrounds have systematically worse chances than others…. But if we wait for certainty we will wait for ever, and the problem is too important and too urgent for that. In the meantime we must work on the basis of a convincing analysis of what we do have". Fabian Society, 2006 (pg 204)*[296].

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# **Appendix 1:** Supplementary information for Chapter 1 "Aims and objectives"

This Appendix contains three papers, based on analyses reported in this thesis, which have been published in peer reviewed journals:

*Based on findings reported in Chapter 6:*

Pearce, A.; Li, L.; Abbas, J.; Ferguson, B.; Graham, H.; Law, C.; the Millennium Cohort Study Child Health Group. "Does childcare influence socioeconomic inequalities in unintentional injury? Findings from the UK Millennium Cohort Study". *Journal of Epidemiology and Community Health*. 2009. **26**;2:161-166.

*Based on findings reported in Chapter 7:*

Pearce, A; Li, L.; Abbas, J.; Ferguson, B.; Graham, H.; Law, C. Childcare use and inequalities in breastfeeding: Findings from the UK Millennium Cohort Study. *Archives of Disease in Childhood*. June 2010, EPub ahead of print. doi:10.1136/adc.2009.177337

*Based on findings reported in Chapter 8:*

Pearce, A.; Li, L.; Abbas, J.; Ferguson, B.; Graham, H.; Law, C.; the Millennium Cohort Study Child Health Group. "Is childcare associated with the risk of overweight and obesity in the early years? Findings from the UK Millennium Cohort Study". *International Journal of Obesity*. 2010; **34**: 1160–1168

# Does childcare influence socioeconomic inequalities in unintentional injury? Findings from the UK Millennium Cohort Study

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## ABSTRACT

**Background** In recent decades the proportion of infants and young children being cared for in childcare has increased. Little is known about the impact that non-parental care has on childhood unintentional injury and whether this varies by socioeconomic group.

**Methods** Using data from a contemporary UK cohort of children at age 9 months (N = 18 114) and 3 years (N = 13 718), Poisson regression was used to explore the association between childcare type (parental, informal, formal) and the risk of unintentional injury, overall and by socioeconomic group.

**Results** At age 9 months there was no overall association between childcare and injury. However, when stratifying the analyses, infants from higher socioeconomic groups were less likely to be injured if they were cared for in formal childcare (compared with being cared for only by a parent), whereas those from lower social groups were more likely to be injured. At age 3 years informal childcare was associated with an increased risk of injury overall; in the stratified analyses this increased risk occurred only in less affluent groups. Formal childcare was no longer associated with injury at age 3 in any strata.

**Conclusions** Previous findings have shown that childcare can have a positive influence on childhood injury; however, a recent Unicef report highlighted that a lack of access to high-quality childcare could lead to a widening of inequalities. Our analyses indicate that childcare does have the potential to widen inequalities in injury; further research is required to understand why childcare has a differential impact on unintentional injury and how this might be prevented.

Female employment has increased dramatically.[1] Approximately 80% of 3–6-year-olds and 25% of under-3s living in OECD (Organisation for Economic Co-operation and Development) countries are now cared for in early childhood education or childcare settings.[2] An assessment of formal childcare in these countries highlighted the potential for childcare to become a new and potent source of inequality if children from more affluent families benefit from high-quality childcare whilst those from disadvantaged backgrounds are at risk of harm from lower quality childcare.[2] Under the UK government childcare strategy, free early years education places are available to all children aged 3–4 years for 12.5 hours a week, being extended to 15 hours a week by 2010.[3] There are also plans to extend a free entitlement of 10 hours a week to 2-year-olds living in the most deprived areas in England.[4]

Formal childcare (childcare delivered through public, private or voluntary institutions such as nurseries or childminders[5]) can have a beneficial effect on children's learning and development[6 7] as well as on long-term outcomes such as crime and teenage pregnancy rates.[7 8] Less is known about the impact childcare may have on physical health, including unintentional injury.[7] Formal childcare might decrease the risk of injury through providing safer environments. It may also promote safety awareness in mothers of young children through health education. A small number of studies have explored the impact of childcare upon unintentional injury, and in general they have indicated that the risk of unintentional injury was lower when in childcare.[9–12] However, all of these studies were based outside the UK and few have explored informal childcare (care by relatives, friends or neighbours, often on an unpaid basis).[5] Furthermore, despite unintentional injury being one of the most socially patterned causes of disability and ill health in children,[13 14] no studies have explored whether childcare has a differential impact on injury according to socioeconomic background.

We explored the association between formal and informal childcare and unintentional injury (referred to only as injury hereafter) and whether it differed by socioeconomic group in a recent cohort of preschool children.

## METHODS

### Participants

We examined data from the Millennium Cohort Study (MCS), a longitudinal study of children born in the UK between September 2000 and January 2002. The first contact with the cohort was at age 9 months, when information was collected (usually from the mother) on 72% of those approached, giving 18 296 singleton infants.[15] Of the original 18 296 singleton infants, 14 630 (80%) took part in the second sweep, when the children were approximately 3 years old. Further information about the data collection and survey design can be found elsewhere.[15 16] Ethical approval was received from the South West and London Multi-Centre Research Ethics Committees.[17]

Our analysis excluded children of respondents who were not natural mothers, leaving a sample size of 18 259 infants at age 9 months and 14 434 at 3 years. Of these, 18 114 (99%) infants had

information on both childcare and injuries at age 9 months and 13 718 (95%) at 3 years.

### Measures of childcare

Mothers were asked about their main childcare arrangement and other childcare arrangements they had regularly used between the child's birth and age 9 months and between age 9 months and 3 years. Childcare type was classified as "parent" if the infant was only cared for by the mother, father or the mother's partner; "informal" if they were also cared for by a friend, neighbour, grandparent or other relative, babysitter or unregistered childminder; and "formal" if they were cared for in a nursery or childcare centre, or by a registered childminder, nanny or au pair. If the main childcare type given was "parent" but an additional arrangement involved non-parental childcare, then this additional childcare type was used in order to assess any regular exposure to non- parental childcare. Where one non-parental childcare type had stopped and been replaced by another, the childcare which the child had been in for the longest duration was used.

### Measures of injury

Infants were classified as having been injured if their mother reported them being taken to a general practitioner (GP) or a hospital Accident and Emergency department (A&E) as the result of an injury one or more times between birth and 9 months and between 9 months and 3 years of age. Whether the injuries occurred in childcare or elsewhere was not reported.

### Measures of socioeconomic background

Measures of socioeconomic background were chosen to represent both the household and the area in which the child lived. Social class of the mother was assessed using the National Statistics Socio-economic Classification (NS-SEC) at the first sweep, collapsed into three categories: managerial and professional, intermediate, and routine and manual occupations. Mothers who were long-term unemployed or had never worked were excluded from the analyses stratified by NS-SEC but were included in all other analyses. Maternal education, again collected at the first sweep, was classified according to the highest educational qualification achieved. Mothers who had "other" qualifications, such as qualifications from overseas, were excluded from the analyses stratified by maternal education. Lone parenthood was categorised as being a lone mother or being part of a couple household at both surveys. Finally, area deprivation was explored using the Index of Multiple Deprivation (IMD) 2004 measured at the Super Output Area (SOA) level.[18] Infants in the MCS were classified, using their home postcode at the first and second sweeps, according to the national deprivation quintiles.

### Analysis

The following analyses were conducted at the two time points. We estimated the percentage uptake of childcare (parent, informal, formal) and also the percentage of children who had attended a GP or A&E due to an injury. Poisson regression was then used to estimate risk ratios (RRs) for being injured according to whether children were regularly cared for in informal or formal childcare compared with those who were cared for only by a parent. The child's gender and age, maternal age at first live birth, the mother's ethnicity, and the number of children living in the household were explored as potential confounders. Those which were significantly associated with both childcare type and injury were included in the adjusted analyses.

The analyses were repeated for each stratum of the socioeconomic measures to explore whether the association between childcare and injury varied in different socioeconomic groups. All analyses were conducted in STATA/SE 10.0 (Stata Corporation, Texas), using survey commands to take into account the sampling design and attrition at the second sweep. Data were obtained from the UK Data Archive, University of Essex, in April 2008.

## RESULTS

### Description of the cohort

At age 9 months almost half of infants were cared for only by a parent; by 3 years this had fallen by one-fifth (table 1). Approximately one-third were cared for in informal childcare at age 9 months and this declined slightly by age 3. Formal childcare use increased between the two sweeps. Between birth and age 9 months 8.1% of infants, and between 9 months and 3 years just over one-third, had been taken to a GP or A&E for an injury. Most reported attending a GP or A&E for an injury only once.

Table 1 also contains the unweighted sociodemographic characteristics of the MCS, which is as expected given the sampling design, with larger proportions from less affluent backgrounds than seen in the UK population.

Table 2 provides unadjusted and adjusted RRs for reported injury by childcare type, at age 9 months (columns B and C) and 3 years (columns E and F), overall and stratified by social group.

### Association between childcare and injury at age 9 months

At age 9 months there was no overall association between childcare and injury in the unadjusted (column B) or adjusted analysis (column C). However, this concealed significant associations which were seen when stratifying by social group. Among infants whose mothers were from the managerial and professional group, those who were cared for in formal childcare were less likely to be injured than those who were cared for only by a parent, and this association strengthened after controlling for confounders. In intermediate groups children cared for in informal childcare had a reduced risk of injury after controlling for confounders. Infants from the routine and manual group who were cared for in formal childcare were more likely to be injured than those being cared for only by a parent. Similarly, infants whose mothers had higher levels of education and were cared for in formal and informal childcare were less likely to be injured, whereas those whose mothers were less educated were more likely to be injured if they were cared for in formal childcare. There were no associations in the analyses stratified by lone parenthood status. Infants living in the most deprived fifth of areas in England were more likely to be injured if they were cared for in informal childcare, although the association was no longer significant after controlling for confounders.

### Association between childcare and injury at age 3 years

At age 3 years informal childcare was associated with a slight increased risk of injury (column E), although this was no longer statistically significant after controlling for confounders (column F). However, in the stratified analyses this elevated risk seen in informal childcare reappeared in certain groups. Children whose mothers were from routine and manual backgrounds and those living in the most deprived fifth of areas in England were more likely to have been injured since the age of 9 months if they were cared for in informal childcare. Children living in couple families and whose mothers were educated to GCSE A–C level and above

**Table 1** Childcare uptake, injury and sociodemographic characteristics at age 9 months and 3 years

| | 9 months | | 3 years | |
|---|---|---|---|---|
| | %* | N | %* | N |
| **Main childcare since birth/last contact** | | | | |
| Parent | 49.7 | 9096 | 40.6 | 5681 |
| Informal | 34.6 | 6649 | 31.1 | 4449 |
| Formal | 15.7 | 2391 | 28.3 | 3621 |
| **Injured since birth/last contact?** | | | | |
| No | 91.9 | 16 794 | 64.4 | 9270 |
| Yes | 8.1 | 1443 | 35.6 | 5108 |
| 1 time | 7.7 | 1373 | 27.5 | 3914 |
| 2 times | 0.3 | 59 | 5.8 | 858 |
| 3 times+ | 0.1 | 11 | 2.3 | 336 |
| Hospitalised | 0.5 | 95 | 2.3 | 330 |
| **NS-SEC** | | | | |
| Managerial and professional | 26.3 | 4742 | 28.7 | 4087 |
| Intermediate | 20.5 | 3684 | 21.3 | 3033 |
| Routine and manual | 42.5 | 7660 | 41.0 | 5841 |
| Long-term unemployed/never worked | 10.7 | 1928 | 9.1 | 1297 |
| **Maternal education** | | | | |
| Degree or above | 15.7 | 2858 | 17.1 | 2469 |
| Diploma | 8.4 | 1522 | 9.1 | 1317 |
| A levels | 9.3 | 1694 | 9.8 | 1408 |
| GCSE A–C | 33.5 | 6092 | 33.7 | 4855 |
| GCSE D–G | 10.8 | 1955 | 10.6 | 1524 |
| None | 19.5 | 3544 | 17.2 | 2471 |
| Other qualifications | 2.9 | 528 | 2.5 | 359 |
| **Lone parenthood** | | | | |
| Couple family | 82.8 | 15 117 | 83.7 | 12 081 |
| Lone parent | 17.2 | 3142 | 16.3 | 2353 |
| **Area deprivation (quintiles)** | | | | |
| Least deprived | 12.3 | 1397 | 16.0 | 1447 |
| Second quintile | 13.3 | 1510 | 15.1 | 1367 |
| Third quintile | 17.1 | 1944 | 18.1 | 1637 |
| Fourth quintile | 21.8 | 2472 | 20.8 | 1887 |
| Most deprived | 35.5 | 4027 | 30.1 | 2729 |
| **Ethnicity** | | | | |
| White British | 82.1 | 14 945 | 83.9 | 12 086 |
| Other white | 1.9 | 341 | 1.8 | 260 |
| Mixed | 1.0 | 188 | 0.9 | 126 |
| Indian | 2.6 | 473 | 2.5 | 365 |
| Pakistani or Bangladeshi | 6.9 | 1254 | 6.2 | 897 |
| Black or Black British | 3.5 | 629 | 2.9 | 417 |
| Other | 2.1 | 381 | 1.8 | 252 |
| **Maternal age (years)** | | | | |
| 14–19 | 21.0 | 3696 | 19.0 | 2665 |
| 20–24 | 28.5 | 5024 | 27.4 | 3832 |
| 25–29 | 27.8 | 4886 | 28.9 | 4049 |
| 30–34 | 17.5 | 3088 | 19.1 | 2677 |
| 35–39 | 4.7 | 831 | 5.1 | 720 |
| 40 plus | 0.5 | 81 | 0.5 | 63 |
| **Number of children in household** | | | | |
| 1 child | 42.0 | 7673 | 41.5 | 5992 |
| 2–3 children | 49.8 | 9099 | 50.7 | 7313 |
| 4 or more children | 8.1 | 1487 | 7.8 | 1129 |

Missing at 9 months: injury 22, childcare 123, NS-SEC 245, maternal education 66, area deprivation 2, maternal age 653, ethnicity 48. Missing at 3 years: injury 9, childcare 683, NS-SEC 176, maternal education 31, area deprivation 1, maternal age 428, ethnicity 31.
*Percentages are weighted for childcare and injury so that they can be extrapolated to the UK. All other percentages are unweighted in order to demonstrate the socioeconomic characterises of the Millennium Cohort Study members.

who were cared for in informal childcare were also more likely to be injured than children cared for only by a parent, although these elevated risks were not significant after controlling for confounders.

## DISCUSSION

### Summary of findings

Overall, childcare use was not associated with the risk of injury at age 9 months. However, when stratifying by socioeconomic background, childcare appeared to have a protective effect against injury for those from higher socioeconomic groups and a detrimental effect for those from lower social groups. At age 3 years informal childcare was associated with a small increased risk of injury. In the stratified analyses the increased risk of injury remained only for children from lower socioeconomic backgrounds. There was no difference in risk for children cared for in formal childcare compared with those cared for only by a parent. There were no associations when stratifying by lone parenthood status.

### Strengths and limitations

The data from the MCS allowed us to differentiate between informal and formal childcare, to explore the association between childcare and injury in different socioeconomic groups and to control for a range of potential confounding factors using a large sample size in a contemporary UK setting. We used survey and response weights to take into account the sampling design and differential response between the two sweeps. Although there was no significant difference in injury rates at age 9 months between children who did not respond to the second sweep and those who did (unweighted risk difference of 0.48%; 95% CI −0.52% to 1.47%), infants who did not take part in the second sweep were more likely to be cared for only by a parent (6.5%; 4.7% to 8.3%) and less likely to be cared for in formal childcare (−5.3%; −6.4% to −4.3%).

Injury was based on maternal report of the child having attended a GP or A&E; therefore, injuries for which no professional advice was sought have not been explored. Attendance at a GP or A&E does not give an indication of the seriousness of the injury. It is possible that the propensity to seek professional advice about injuries, or to recall them, may vary by socioeconomic background. Studies have shown a reasonable to high level of agreement between maternal recall of injury and medical records, with no differences by socioeconomic characteristics.[19–21] However, evidence suggests that parents from more advantaged backgrounds are more likely to take their child to A&E for minor injuries than those from less advantaged backgrounds.[22 23] If such biases exist in the MCS and if they operate differently according to childcare type, then it is possible that the associations we have found may be confounded.

We were not able to determine whether the injuries occurred when in childcare. Therefore, we were unable to establish whether childcare influenced the risk of injury for the time when the child was in childcare, or if health education occurring in the childcare setting influenced risk-taking behaviours elsewhere or safety within the home. Although most studies have compared the incidence of injury in childcare to the incidence of injury at home,[9–11] one US study found that the children who attended childcare centres had a slightly reduced risk of being injured anywhere.[12] This implies childcare has an influence through health education.

We used a simple categorisation of informal and formal childcare. For example, nannies and au pairs were classified as formal childcare, although they might be considered informal carers. We investigated the main childcare type used across the periods in question; approximately one-third of mothers using informal or formal childcare used at least one additional childcare arrangement (either with the main childcare type or as a replacement) and our analyses have not taken this into account. We repeated our analyses excluding children who

**Table 2** Association between main childcare type and reported injury at age 9 months and 3 years: unadjusted, adjusted and stratified risk ratios (RRs) (95% CIs)

| | Age 9 months | | | Age 3 years | | |
|---|---|---|---|---|---|---|
| | % (N) injured | Unadjusted RR | Adjusted RR† | % (N) injured | Unadjusted RR | Adjusted RR† |
| **Childcare** | **A** | **B** | **C** | **D** | **E** | **F** |
| **Overall association** | | | | | | |
| Parent | 8.2 (709) | 1 | 1 | 34.8 (1953) | 1 | 1 |
| Informal | 8.4 (542) | 1.03 (0.91 to 1.17) | 0.93 (0.81 to 1.06) | 37.4 (1651) | 1.07 (1.00 to 1.15)* | 1.05 (0.98 to 1.13) |
| Formal | 7.5 (188) | 0.92 (0.77 to 1.11) | 0.89 (0.73 to 1.08) | 35.0 (1268) | 1.00 (0.93 to 1.08) | 1.03 (0.95 to 1.11) |
| **Stratified associations (NS-SEC)** | | | | | | |
| *Managerial and professional* | | | | | | |
| Parent | 9.0 (136) | 1 | 1 | 33.2 (287) | 1 | 1 |
| Informal | 8.1 (123) | 0.89 (0.69 to 1.16) | 0.82 (0.63 to 1.05) | 33.8 (442) | 1.02 (0.87 to 1.19) | 0.99 (0.85 to 1.15) |
| Formal | 6.6 (111) | 0.73 (0.55 to 0.97)* | 0.67 (0.50 to 0.90)* | 33.1 (571) | 1.00 (0.88 to 1.13) | 0.98 (0.87 to 1.11) |
| *Intermediate* | | | | | | |
| Parent | 8.7 (132) | 1 | 1 | 34.6 (320) | 1 | 1 |
| Informal | 6.6 (106) | 0.76 (0.57 to 1.02) | 0.70 (0.52 to 0.93)* | 35.6 (409) | 1.03 (0.90 to 1.17) | 1.03 (0.90 to 1.17) |
| Formal | 8.2 (41) | 0.95 (0.64 to 1.40) | 0.87 (0.59 to 1.29) | 35.0 (267) | 1.01 (0.85 to 1.20) | 1.01 (0.86 to 1.20) |
| *Routine and manual* | | | | | | |
| Parent | 8.4 (375) | 1 | 1 | 37.1 (1073) | 1 | 1 |
| Informal | 9.6 (273) | 1.15 (0.95 to 1.38) | 1.04 (0.86 to 1.26) | 41.4 (727) | 1.12 (1.02 to 1.22)* | 1.09 (1.00 to 1.20)* |
| Formal | 12.5 (31) | 1.50 (1.03 to 2.17)* | 1.47 (1.01 to 2.14)* | 40.6 (362) | 1.09 (0.98 to 1.23) | 1.11 (0.99 to 1.25) |
| **Maternal education** | | | | | | |
| *GCSE A–C plus* | | | | | | |
| Parent | 9.0 (466) | 1 | 1 | 34.7 (1099) | 1 | 1 |
| Informal | 8.4 (381) | 0.93 (0.80 to 1.08) | 0.85 (0.73 to 0.98)* | 38.0 (1284) | 1.09 (1.00 to 1.19)* | 1.08 (0.99 to 1.18) |
| Formal | 7.0 (166) | 0.78 (0.64 to 0.95)* | 0.76 (0.62 to 0.94)* | 34.4 (1029) | 0.99 (0.91 to 1.08) | 1.03 (0.93 to 1.13) |
| *GCSE D–G or less* | | | | | | |
| Parent | 6.8 (228) | 1 | 1 | 35.6 (794) | 1 | 1 |
| Informal | 8.7 (153) | 1.27 (0.99 to 1.62) | 1.14 (0.89 to 1.45) | 35.9 (345) | 1.01 (0.89 to 1.14) | 0.95 (0.84 to 1.08) |
| Formal | 15.6 (19) | 2.28 (1.45 to 3.56)* | 2.18 (1.37 to 3.46)* | 39.4 (217) | 1.10 (0.96 to 1.27) | 1.07 (0.93 to 1.24) |
| **Lone parenthood** | | | | | | |
| *Couple family* | | | | | | |
| Parent | 7.9 (530) | 1 | 1 | 33.7 (1569) | 1 | 1 |
| Informal | 8.1 (440) | 1.03 (0.90 to 1.19) | 0.91 (0.79 to 1.05) | 36.7 (1372) | 1.09 (1.01 to 1.17)* | 1.06 (0.98 to 1.14) |
| Formal | 7.4 (173) | 0.94 (0.77 to 1.15) | 0.87 (0.71 to 1.08) | 33.9 (1041) | 1.01 (0.93 to 1.09) | 1.02 (0.93 to 1.10) |
| *Lone parent* | | | | | | |
| Parent | 9.5 (179) | 1 | 1 | 40.3 (384) | 1 | 1 |
| Informal | 10.2 (102) | 1.07 (0.78 to 1.47) | 1.01 (0.74 to 1.39) | 40.9 (279) | 1.02 (0.88 to 1.18) | 1.01 (0.88 to 1.18) |
| Formal | 8.5 (15) | 0.89 (0.51 to 1.54) | 0.99 (0.57 to 1.74) | 40.9 (227) | 1.02 (0.88 to 1.17) | 1.08 (0.94 to 1.25) |
| **Area deprivation‡** | | | | | | |
| *Least deprived* | | | | | | |
| Parent | 8.6 (55) | 1 | 1 | 31.1 (133) | 1 | 1 |
| Informal | 8.6 (31) | 1.00 (0.66 to 1.53) | 0.92 (0.61 to 1.40) | 27.5 (95) | 0.88 (0.71 to 1.11) | 0.87 (0.69 to 1.09) |
| Formal | 6.8 (26) | 0.79 (0.50 to 1.24) | 0.75 (0.47 to 1.18) | 31.8 (186) | 1.02 (0.85 to 1.23) | 1.04 (0.86 to 1.26) |
| *Second quintile* | | | | | | |
| Parent | 8.4 (55) | 1 | 1 | 32.4 (139) | 1 | 1 |
| Informal | 6.4 (32) | 0.76 (0.50 to 1.18) | 0.68 (0.44 to 1.04) | 34.8 (143) | 1.07 (0.88 to 1.31) | 1.08 (0.88 to 1.32) |
| Formal | 7.4 (26) | 0.89 (0.56 to 1.41) | 0.83 (0.52 to 1.33) | 34.1 (165) | 1.05 (0.87 to 1.27) | 1.04 (0.86 to 1.27) |
| *Third quintile* | | | | | | |
| Parent | 7.4 (67) | 1 | 1 | 35.5 (210) | 1 | 1 |
| Informal | 7.6 (51) | 1.03 (0.71 to 1.48) | 0.89 (0.61 to 1.30) | 39.6 (202) | 1.12 (0.95 to 1.31) | 1.09 (0.92 to 1.28) |
| Formal | 5.5 (16) | 0.74 (0.43 to 1.28) | 0.62 (0.34 to 1.11) | 36.2 (152) | 1.02 (0.85 to 1.22) | 1.00 (0.84 to 1.20) |
| *Fourth quintile* | | | | | | |
| Parent | 8.9 (106) | 1 | 1 | 37.2 (250) | 1 | 1 |
| Informal | 10.4 (91) | 1.17 (0.88 to 1.56) | 1.07 (0.80 to 1.43) | 40.3 (246) | 1.08 (0.93 to 1.26) | 1.09 (0.94 to 1.27) |
| Formal | 9.1 (23) | 1.02 (0.65 to 1.61) | 1.01 (0.63 to 1.62) | 36.5 (151) | 0.98 (0.82 to 1.17) | 1.05 (0.88 to 1.26) |
| *Most deprived* | | | | | | |
| Parent | 7.4 (159) | 1 | 1 | 34.1 (481) | 1 | 1 |
| Informal | 10.2 (114) | 1.38 (1.08 to 1.77)* | 1.22 (0.94 to 1.58) | 42.1 (238) | 1.23 (1.08 to 1.41)* | 1.15 (1.00 to 1.31)* |
| Formal | 10.3 (18) | 1.38 (0.81 to 2.35) | 1.36 (0.79 to 2.34) | 36.8 (170) | 1.08 (0.92 to 1.26) | 1.05 (0.89 to 1.23) |

Missing at 9 months: injury 22, childcare 123, NS-SEC 245, maternal education 66, area deprivation 2, maternal age 653, ethnicity 48. Missing at 3 years: injury 9, childcare 683, NS-SEC 176, maternal education 31, area deprivation 1, maternal age 428, ethnicity 31.

*$p<0.05$.

†Adjusted for maternal age, ethnicity, family size.

‡Analyses include children living in England only.

attended more than one type of childcare and also excluding nannies and au pairs and the associations were little changed (data not shown). Finally socioeconomic status may have changed between the two sweeps, therefore underestimating the associations in the stratified analyses.

### Comparison with other findings

Several studies found that the risk of injury was lower in children cared for in formal childcare than those cared for at home. A US study from the mid-1980s recording injuries using telephone surveys found that, in children aged 18–59 months, rates of injury were significantly lower in childcare (defined as any out-of-home childcare) than at home.[11] A Norwegian study using hospital registration data found formal childcare to be protective for children aged 2 years or less, although not for those aged 3–6.[10] One US study, like ours, explored the risk of injury occurring anywhere (based on maternal report) according to childcare use and found that children who were cared for in registered childcare centres were less likely to be injured than those who were only cared for at home.[12] Another US study conducted in the 1980s using surveillance data on injuries in children aged 5 years and under found that rates of injury were consistently lower in childcare than at home, in all age groups (in 1-year intervals), although none reached statistical significance.[9] Our study also found that overall children cared for in formal childcare at age 9 months and 3 years were not significantly less likely to be injured. These inconsistencies might be explained by the different age groups or time periods in which the observations were made.

At age 3 we found that informal childcare was associated with a small increased risk of injury. This contradicts previous findings from two studies exploring informal childcare in the US in the 1990s; the first found that children cared for in family-based childcare settings (mostly unlicensed) had lower rates of injury,[12] whereas the second study, which sought to explore whether care by grandparents increased the risk of injury in young children, concluded that it did not.[24]

It has been hypothesised that increasing childcare use may widen inequalities due to higher socioeconomic groups being able to afford higher quality childcare.[2 6] Our study is the first, to our knowledge, to have explored the association between childcare and childhood injury in different social groups, and our findings go someway to support this hypothesis. It is possible that the overall beneficial effect of childcare observed in previous studies is explained by more affluent study samples. Future studies should explore the effects of childcare for different groups.

The differential associations we have found might be explained by infants from poorer households experiencing lower quality formal childcare than those from more affluent backgrounds. Information on childcare quality was not available in the MCS so we were unable to test this hypothesis. Studies which have explored formal childcare quality found no overall association with injury in children aged 2–6 years[25] and 6 months to 5 years,[12] although no study to our knowledge has focused on the issue of quality specifically in infants. Alternatively, the differential associations might be explained by variations in the ability of families to transfer the health-promoting benefits of childcare to the home and other settings. Further research into formal childcare quality and injury in infants could add to this debate.

### Implications for policy and practice

Our analyses and findings from existing literature imply that childcare can reduce injuries occurring both in childcare and elsewhere. We have shown that the association of childcare with injury varies by social group. Increasing the number of infants cared for in formal childcare without addressing the factors that may be causing these differential effects, such as quality and affordability, could widen inequalities in injury. This requires further research.

The UK government's proposal to improve education and training for childcare staff[3] could help to raise the standard of formal childcare received by infants from lower socioeconomic groups, and therefore has the potential to reduce inequalities in infant injury. Current proposals to extend the provision of free childcare places to 2-year-olds living in deprived areas[4] may help to equalise the quality of formal childcare received by this younger age group, although our findings suggest that extending this provision to infants may also help to reduce inequalities in injury. The government's move to increase the proportion of childminders who are registered[3] might reduce the detrimental impact of informal childcare upon injury in children from lower socioeconomic groups, by decreasing exposure to informal (or unregulated) childcare. Efforts focused on increasing awareness and improving the safety of home environments of informal carers living in more deprived areas and poorer households could have a beneficial effect for children cared for by friends, neighbours and relatives.

### What is already known on this subject

- There has been a dramatic increase in childcare use in recent decades.
- There is some evidence to suggest that the risk of unintentional injury is lower when in childcare.
- Little is known about the impact that childcare might have on unintentional injury in different social groups.

### What this study adds

- Childcare use was associated with an increased risk of injury for infants from disadvantaged backgrounds and a reduced risk for those from more affluent backgrounds.
- Childcare therefore has the potential to widen inequalities in injury.
- Further research is required to understand why these differential effects might be occurring.

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# Childcare use and inequalities in breastfeeding: findings from the UK Millennium Cohort Study

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# Childcare use and inequalities in breastfeeding: findings from the UK Millennium Cohort Study

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## ABSTRACT

**Background** UK breastfeeding rates are low and socially distributed. Childcare provides a potential setting for breastfeeding promotion. However, little is known about the association between childcare and breastfeeding in different socio-economic groups.

**Methods** Using data from a contemporary UK cohort of infants (n=18 050) the authors calculated RR for breastfeeding for at least 4 months according to informal childcare (care by friends, grandparents, other relatives, etc) and formal childcare (eg, nurseries, crèches), both lasting at least 10 h a week and commencing before the age of 4 months, compared to being cared for 'only by a parent' (this includes childcare for less than 10 h a week), overall and by socio-economic group.

**Results** Compared to being looked after only by a parent, informal (RR 0.51 (95% CI 0.43 to 0.59)) and formal (0.84 (0.72 to 0.99)) childcare was associated with a reduced likelihood of breastfeeding. For informal childcare, both part-time and full-time care was associated with a reduced risk of breastfeeding, whereas for formal care, only full-time formal childcare was associated with a reduced likelihood of breastfeeding. The reduced likelihood of breastfeeding in informal childcare was similar across all socio-economic groups, whereas for formal childcare the reduced likelihood was only seen for mothers from managerial and professional backgrounds (0.76 (0.62 to 0.94)), those who had a degree (0.71 (0.58 to 0.86)) and couple families (0.79 (0.66 to 0.94)). In contrast, lone mothers were more likely to breastfeed if their infant was cared for in formal childcare (1.65 (1.04 to 2.63)).

**Conclusions** Informal childcare was associated with a reduced likelihood of breastfeeding for all groups of mothers. Formal childcare arrangements were only associated with a reduced likelihood of breastfeeding if used full-time by more advantaged families.

## BACKGROUND

The World Health Organization recommends that infants be exclusively breastfed for 6 months. However in 2005 only 25% of mothers living in the UK breastfed (exclusively or otherwise) for at least 6 months and mothers from lower socio-economic backgrounds were less likely to breastfeed.[1]

A few studies, based in the USA, have found that infants being cared for in formal and informal childcare have lower rates of breastfeeding than those cared for only by their parents.[2 3] However, childcare might also be a potential setting to promote continuation of breastfeeding, particularly given recent policy initiatives to promote high quality childcare for all.[4] We explored the association between childcare and breastfeeding in a contemporary UK cohort, and whether this varied by mother's socio-economic status—to our knowledge the first study to do this.

## SUBJECTS AND METHODS

### Subjects and design

We examined data from the UK Millennium Cohort Study, a longitudinal study of children born in 2000–2002.[5] The first contact with the cohort was at age 9 months, when information was collected on 72% of those approached, giving 18 296 singleton infants. Ethical approval was received from the South West and London Multi-Centre Research Ethics Committees. Our analysis excluded infants if the main respondent was not their natural mother (n=37), or if they had missing childcare (n=185) or breastfeeding (n=24) information, leaving 18 050 infants.

### Measures

For this paper we defined infants as having been breastfed if they had been given any breast milk for at least 4 calendar months (≥17.4 weeks), the minimum duration recommended by the World Health Organization until 2003.

Childcare lasting for at least 10 h a week and commencing before the child turned 4 months was categorised: as 'informal' if the care was provided by a friend, neighbour, grandparent or other relative, babysitter or unregistered childminder; or 'formal' if the infant was cared for in a nursery or childcare centre, or by a registered childminder, nanny or au pair. Infants who had been in non-parental childcare for less than 10 h a week before 4 months were classified as being cared for only by a parent since these shorter periods of childcare would be unlikely to impact on infant feeding. We also classified intensity of childcare as part-time (10–30 h a week) or full-time (>30 h).

### Measures of socio-economic background

Measures were chosen to represent both the household and area in which the infant lived. Social class of the mother was assessed using the National Statistics Socio-economic Classification, collapsed into three categories: managerial and professional; intermediate; and routine and manual occupations. Highest maternal educational qualification was also divided into three categories: no qualifications or GCSE grades D–G; GCSE grades A–C, A Levels or a Diploma; or a Degree. 'Lone parenthood' was categorised as being a lone mother versus being part of a couple family.

Area deprivation was categorised in quintiles, using the Index of Multiple Deprivation 2004, measured at the Super Output Area level.

### Potential confounders

We explored several maternal socio-demographic characteristics which might confound the association between childcare and breastfeeding: ethnicity, parity, age at first live birth and paid employment in the first 4 months of the infant's life.

## ANALYSIS

We used Poisson regression to estimate RR for breastfeeding for at least 4 months according to childcare type and intensity. Adjusted RRs were calculated controlling for the potential confounders. These analyses were then repeated in strata defined by each of the socio-economic measures. All analyses were conducted in STATA/SE V.10.0, using survey commands to take into account the sampling design. Data were obtained from the UK Data Archive, University of Essex in April 2008.

## RESULTS

Around a third of infants (n=5360) were breastfed for at least 4 months. Between birth and age 4 months, 7% of infants were cared for in informal childcare for at least 10 h a week (n=1430) (approximately three quarters were cared for by grandparents) and 2.3% in formal childcare (n=360) (data not shown).

Infants in informal childcare (both part-time and full-time) were less likely to be breastfed than infants who were cared for only by a parent, both before (table 1, col B) and after adjustment (col C). For formal childcare (compared to those cared for only by a parent), a similar but less pronounced association emerged only after controlling for confounders, and only for full-time (and not part-time) formal childcare.

In the stratified analyses, the proportion of mothers who breastfed was consistently lower in the less advantaged groups, across all childcare types (col A). The reduced likelihood of breastfeeding in informal childcare compared to parental care was seen in all socio-economic groups. Formal childcare was only associated with lower RRs for breastfeeding in mothers from the most advantaged backgrounds and in couple families. In contrast, lone mothers were almost twice as likely to breastfeed if the infant was cared for in formal childcare.

## DISCUSSION

Compared to those cared for only by a parent (or in childcare for less than 10 h a week), infants were less likely to be breastfed (at all) if they were cared for in informal childcare (both part-time and full-time) and in formal childcare (after adjustment, and for full-time care only) before the age of 4 months. These UK patterns are consistent with findings from the USA.[2 3] To our knowledge ours is the first study to explore the association in different socio-economic groups and our findings imply that, while informal childcare has a detrimental affect on breastfeeding in all social groups, only mothers from the highest socio-economic groups were less likely to breastfeed if they used formal childcare.

We were able to adjust for a range of potential confounding factors, and despite relatively small sample sizes in the stratified analyses, we were able to detect significant associations. We were only able to take into account the main type of childcare used before the age of 4 months. However, when we repeated the analyses excluding those infants cared for in more than one type of childcare between birth and 9 months (since we were not able to identify the age at which additional childcare arrangements began), the power was reduced but the size and direction of the associations remained similar.

Adjustment for maternal employment did not change the association between childcare and breastfeeding. This implies that childcare may influence the likelihood of breastfeeding over and above the effect of entering paid employment. However, we explored the association between childcare commencing anytime before the age of 4 months and the likelihood of breastfeeding for at least 4 months. Childcare did not necessarily precede the cessation of breastfeeding within this 4-month window, and some mothers did not initiate breastfeeding at all. It is likely that, for many mothers, it is not childcare use in isolation that influences the decision to breastfeed, but a chain of antenatal decisions about infant feeding, childcare and employment. It is also possible that the patterns we observed are due to residual confounding. For example, lone mothers who use formal childcare are likely to be different from mothers living in a couple household who use formal childcare. While we were able to control for a number of confounding factors, it is possible that the mothers differ in some other way that could not be captured using the measures in this study.

The proportion of infants in informal and formal childcare before the age of 4 months was low (9%). However, this may increase, given the upward trend in maternal employment. The lower likelihood of being breastfed experienced by infants cared for by family, friends and neighbours was evident in all socio-economic groups. Therefore breastfeeding campaigns in the UK might be aimed at all members of society, as well as targeting disadvantaged current and future mothers. A recent study of 215 mothers of 1-year-old infants asked where they obtained information and advice about infant feeding, and grandparents were the second most commonly cited source (53%).[6] Furthermore, the majority of informal carers in the UK are grandparents, who offer flexible and affordable childcare that many parents view as the best alternative to parental care. Information and advice about supporting mothers to breastfeed might be offered to grandparents through channels such as the recently launched http://begrand.net/ a UK website for grandparents. The move by the UK government in the 2009 budget to provide grandparents with National Insurance credits for caring for grandchildren may also provide a vehicle for health promotion.

Formal childcare was associated with a lower likelihood of breastfeeding in more affluent groups and couple families but with a higher likelihood of breastfeeding in lone parents. Lone mothers who use formal childcare may differ from those who use informal or no childcare. However, formal childcare arrangements may be supportive for some groups, such as lone mothers, who traditionally do not breastfeed.

Childcare centres offer a potential setting to promote breastfeeding, for example through offering storage of expressed milk and encouraging mothers to continue to breastfeed. Greater support during pregnancy and after birth may help mothers when making decisions about infant feeding, employment and childcare, enabling them to consider all possible options (such as the potential to use expressed breast milk). Qualitative research into how childcare acts to facilitate or discourage breastfeeding for mothers from different socio-economic groups may help to target policy and practice more effectively.

**Table 1** Unadjusted and adjusted RR for breastfeeding for at least 4 months, by childcare type and intensity, and stratified by mother's socio-economic status

| | Breastfed % (n) | RR | Adjusted RR† |
|---|---|---|---|
| | *Col A* | *Col B* | *Col C* |
| Overall association | | | |
| Parent | 34.1 (5003) | – | – |
| Informal | 13.7 (187) | 0.40 (0.35–0.47)* | 0.51 (0.43–0.59)* |
| Formal | 31.3 (103) | 0.92 (0.78–1.08) | 0.84 (0.72–0.99)* |
| Time spent in childcare | | | |
| Parent | 34.1 (5003) | – | – |
| Informal P/T | 14.0 (153) | 0.41 (0.35–0.49)* | 0.54 (0.45–0.63)* |
| Informal F/T | 12.5 (63) | 0.37 (0.25–0.55)* | 0.42 (0.28–0.64)* |
| Formal P/T | 36.0 (34) | 1.06 (0.87–1.29) | 1.01 (0.82–1.24) |
| Formal F/T | 25.9 (40) | 0.76 (0.56–1.03) | 0.68 (0.51–0.92)* |
| Stratified by socio-economic status | | | |
| NS-SEC | | | |
| Routine and Manual | | | |
| Parent | 21.0 (1307) | – | – |
| Informal | 8.3 (50) | 0.39 (0.29–0.54)* | 0.47 (0.34–0.66)* |
| Formal | 11.9 (5) | 0.57 (0.24–1.34) | 0.54 (0.21–1.36) |
| Intermediate | | | |
| Parent | 36.6 (1099) | – | – |
| Informal | 16.0 (50) | 0.44 (0.33–0.58)* | 0.50 (0.37–0.67)* |
| Formal | 20.6 (22) | 0.83 (0.56–1.25) | 0.84 (0.57–1.23) |
| Managerial and Prof | | | |
| Parent | 52.0 (20632) | – | – |
| Informal | 20.5 (60) | 0.39 (0.30–0.51)* | 0.50 (0.39–0.65)* |
| Formal | 36.2 (70) | 0.70 (0.58–0.85)* | 0.76 (0.62–0.94)* |
| Maternal education | | | |
| None – GCSE D–G | | | |
| Parent | 16.6 (822) | – | – |
| Informal | 6.5 (35) | 0.39 (0.25–0.62)* | 0.44 (0.27–0.71)* |
| Formal | 14.4 (6) | 0.87 (0.35–2.13) | 1.00 (0.44–2.28) |
| GCSE A–C, A Levels, Diploma | | | |
| Parent | 31.7 (2361) | – | – |
| Informal | 12.1 (92) | 0.38 (0.30–0.47)* | 0.47 (0.37–0.59) |
| Formal | 24.5 (40) | 0.77 (0.60–1.00) | 0.83 (0.64–1.08) |
| Degree | | | |
| Parent | 64.9 (1580) | – | – |
| Informal | 46.5 (48) | 0.72 (0.57–0.90)* | 0.82 (0.64–1.06) |
| Formal | 44.6 (56) | 0.69 (0.56–0.84)* | 0.71 (0.58–0.86)* |
| Lone parenthood | | | |
| Lone parent | | | |
| Parent | 17.3 (440) | – | – |
| Informal | 6.6 (21) | 0.38 (0.23–0.63)* | 0.40 (0.25–0.65)* |
| Formal | 33.8 (20) | 1.95 (1.28–2.99)* | 1.65 (1.04–2.63)* |
| Couple family | | | |
| Parent | 36.8 (4563) | – | – |
| Informal | 15.5 (166) | 0.42 (0.36–0.50)* | 0.53 (0.44–0.63)* |
| Formal | 30.8 (83) | 0.84 (0.70–0.99)* | 0.79 (0.66–0.94)* |
| Area deprivation | | | |
| Most deprived | | | |
| Parent | 24.1 (974) | – | – |
| Informal | 14.3 (54) | 0.60 (0.44–0.80)* | 0.72 (0.53–0.97)* |
| Formal | 16.9 (8) | 0.70 (0.34–1.43) | 0.63 (0.28–1.39) |
| 4 | | | |
| Parent | 29.2 (698) | – | – |
| Informal | 14.4 (32) | 0.49 (0.34–0.72)* | 0.54 (0.36–0.81)* |
| Formal | 35.9 (19) | 1.23 (0.83–1.83) | 1.12 (0.73–1.72) |
| 3 | | | |
| Parent | 35.0 (651) | – | – |
| Informal | 14.0 (20) | 0.40 (0.25–0.63)* | 0.51 (0.33–0.80)* |
| Formal | 40.4 (18) | 1.15 (0.78–1.70) | 1.27 (0.86–1.85) |
| 2 | | | |
| Parent | 45.5 (621) | – | – |
| Informal | 14.0 (11) | 0.31 (0.17–0.54)* | 0.37 (0.21–0.65)* |
| Formal | 33.5 (16) | 0.74 (0.49–1.10) | 0.71 (0.47–1.06) |
| Least deprived | | | |
| Parent | 46.9 (610) | – | – |
| Informal | 18.5 (9) | 0.39 (0.22–0.71)* | 0.48 (0.26–0.88)* |
| Formal | 29.8 (14) | 0.64 (0.41–0.99)* | 0.64 (0.42–1.00) |

*$p<0.05$.
†Adjusting for mother's ethnicity, parity, age at first live birth, whether the mother returned to work before the infant was age 4 months.
Missing: breastfeeding – 24, childcare – 185, ethnicity – 48, parity – 635, maternal age at first live birth – 653, NS-SEC 245, maternal education – 66, area deprivation – 2.
NS-SEC, National Statistics Socio-economic Classification.

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# PEDIATRIC HIGHLIGHT

# Is childcare associated with the risk of overweight and obesity in the early years? Findings from the UK Millennium Cohort Study

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**Background:** A recent assessment of childcare in OECD (Organisation for Economic Co-operation and Development) countries highlighted the potential for childcare to widen inequalities. Although childcare offers a potential setting for obesity prevention, little research has analysed the association between childcare and overweight, particularly in different socio-economic groups.
**Objectives:** Our primary objective was to explore the association between childcare and overweight (including obesity), both overall and by socio-economic background, in a contemporary UK cohort of children at age 3 years ($N = 12\,354$). Our secondary objective was to explore infant feeding as a potential mediator between childcare in infancy and overweight at age 3 years.
**Results:** After controlling for confounders, children who were cared for in informal childcare (75% grandparents) between the age of 9 months and 3 years were more likely to be overweight than those cared for only by a parent (adjusted risk ratio (aRR) = 1.15, 95% confidence interval (CI) 1.04–1.27), particularly if they were in full-time childcare (aRR = 1.34, 95% CI 1.15–1.57). When stratifying by socio-economic background, the increased risk of overweight in informal childcare (compared with parental care) was limited to children from more advantaged groups: those whose mother was from a managerial or professional background (aRR = 1.23, 95% CI 1.02–1.47), had a degree (RR = 1.43, 95% CI 1.13–1.83) or lived in a couple household (RR = 1.18, 95% CI 1.06–1.32). There was no association between formal childcare and overweight. Infant feeding did not mediate the association between childcare use in infancy and overweight at age 3 years.
**Conclusions:** Children from more advantaged families who use informal childcare are at increased risk of overweight. The UK government's drive to support parents into paid employment should be accompanied by health-related information and support for both informal and formal carers. As the majority of informal carers were grandparents, the recent government announcement to provide grandparents with National Insurance credits for caring for grandchildren provides a potential opportunity for health promotion.
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**Keywords:** preschool children; childhood obesity; childcare; socio-economic inequalities; public policy

## Introduction

Nearly one-quarter of preschool children are overweight or obese,[1–4] with higher rates observed in those living with a lone parent[5] or in more deprived areas.[3,6] A recent review of overweight and obesity in infants and preschool children highlighted an urgent need for research and policies on the prevention and treatment of overweight and obesity in this age group.[7] Approximately 80% of 3- to 6-year-old children and 25% younger than 3 years living in OECD (Organisation for Economic Co-operation and Development) countries are now in some form of early childhood education or childcare[8]; childcare therefore has the potential to be a valuable setting for obesity prevention.[9] Childcare might influence weight status through affecting infant feeding (such as the propensity to breastfeed) and the diets and physical activity levels of toddlers. However, there is little research analysing the association between childcare and overweight,[10,11] particularly in the United Kingdom.

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[4]See Appendix.
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Three US-based studies found that children cared for in informal childcare were at an increased risk of overweight.[12–14] In contrast, two studies set in Japan using the same cohort found no association between childcare (informal or formal) and obesity,[15,16] whereas another US-based study found that formal childcare had a protective influence.[17] An assessment of childcare in OECD countries recently highlighted its potential to widen inequalities, if children from wealthier backgrounds benefit from better-quality childcare than those from less-affluent backgrounds.[8] However, only two studies to our knowledge have explored measures of affluence as potential effect modifiers of the relationship between childcare and overweight, with inconclusive results[17,18].

We analysed the association between childcare use between the age of 9 months and 3 years and overweight at age 3 years, both overall and in different social groups, in a contemporary UK cohort. We also explored infant feeding as a potential mediator between childcare use in infancy and overweight at age 3 years.

## Subjects and methods

*Subjects and design*

We examined data from the Millennium Cohort Study, a longitudinal study of children born in the United Kingdom between September 2000 and January 2002. A stratified clustered sampling design was used to over-represent children living in the three smaller UK countries (Wales, Scotland or Northern Ireland), disadvantaged areas and those with high proportions of ethnic minority groups.[19] Interviews were carried out by trained interviewers in the home with the main caregiver, who was usually the mother. The first sweep took place when the cohort was of the age of 9 months. Information was collected on 72% of those approached, giving 18 296 singleton infants.[20] Of the original 18 296 singleton infants, 14 630 (80%) took part in the second sweep when the children were approximately 3 years old. Those who did not take part in the second sweep were more likely to be from an ethnic minority background or a more disadvantaged household, although because of the sample design, these proportions remained higher than the general population. Those who did not take part in the second sweep were also more likely to be cared for only by a parent between birth and 9 months of age (70.7%) than those who did (65.3%, $P<0.05$). They were also less likely to be cared for in formal childcare (7.4% compared with 12.2%, $P<0.05$). Weights were used to take account of the initial sampling design and differential response at the second sweep. Ethical approval was received from the South West and London Multi-Centre Research Ethics Committees for the first and second sweeps, respectively.[21] The present analyses did not require additional ethics approval.

This paper presents analyses based on data from children who were included in the first and second sweeps, excluding respondents who were not natural mothers ($n=196$), leaving a sample size of 14 434. Of these, 12 354 had complete childcare and height/weight data.

*Obesity*

Trained interviewers weighed the children when they were of age 3 years, without shoes or outdoor clothing, using Tanita HD-305 scales (Tanita UK Ltd., Middlesex, UK), and weights were recorded in kg to one decimal place. Heights were measured with the Leicester Height Measure Stadiometer (Seca Ltd., Birmingham, UK) and recorded to the nearest mm. Childhood overweight (including obesity) was defined by the International Obesity Task Force cutoffs for body mass index.

*Infant feeding*

At the first sweep, mothers were asked whether they had initiated breastfeeding and if so, how long they had breastfed for. We examined breast-feeding, categorized as never breastfed, breastfed for $<4$ calendar months ($<17.4$ weeks) or breastfed for $\geqslant 4$ calendar months ($\geqslant 17.4$ weeks), as at the time of the Millennium Cohort Study births, this was the minimum duration recommended by the World Health Organisation.[22] We also explored the age at which the mother introduced solids using the same 4-month cutoff, based on the UK government recommendations at that time.[23]

*Childcare*

Information obtained at the first sweep was used to determine childcare use between birth and 4 months. Information on childcare between 9 months and 3 years was collected at the second sweep.

Mothers reported whether they had made regular childcare arrangements and if so what the main arrangements were. In cases in which the mother has used more than one main childcare arrangement, the childcare in which the infant had been for the longest duration was used. Childcare type was classified 'informal' if the infant was cared for by a friend, neighbour, grandparent or other relative, babysitter or unregistered childminder; and 'formal' if they were cared for in a nursery or childcare centre, or by a childminder (not reported as being unregistered), nanny or au-pair. Children who had not been cared for in childcare were classified as being cared for only by a parent. Informal and formal childcare that lasted for $<10$ h a week on average was reclassified as being cared for only by a parent, as these shorter periods of childcare would be unlikely to affect infant feeding, diet and physical activity to a degree that would influence weight status.[18]

*Measures of socio-economic background*

Measures of socio-economic background were chosen to represent both the household and area in which the child

lived. Social class of the mother was assessed using the National Statistics Socio-Economic Classification (NS-SEC), which was provided at the first sweep, and was collapsed into three categories: managerial and professional, intermediate, and routine and manual occupations. Highest maternal educational qualification, which was collected at the first sweep, was classified as having no educational qualifications, GCSE (General Certificate of Secondary Education) grades D–G, GCSE grades A*–C, A Levels, Diploma, or Degree and above. Children whose mothers reported being long-term unemployed or having never worked were excluded from the analyses that were stratified by NS-SEC but were included in all other analyses. Correspondingly, children whose mothers who had 'other' educational qualifications, such as qualifications from overseas, were excluded from the analyses that were stratified by education. Lone parenthood was categorized as being a lone mother or being part of a couple household at the second sweep. Finally, in children living in England only, we explored area deprivation using the Index of Multiple Deprivation 2004, measured at the super output area level.[24] Millennium Cohort Study children were classified, using their home postcode at the second sweep, according to the national quintiles.

*Potential confounders*

We explored a range of potential confounders that were identified in previous analyses as being related to overweight[5]: maternal pre-pregnancy overweight, the mother's ethnicity, number of children living in the household, whether the mother smoked during pregnancy and the child's birthweight *z*-scores (calculated using the British 1990 growth reference, adjusted for gestational age and gender) and also maternal age at first live birth. These were all captured at the first sweep, except for number of children living in the household, which was taken from the first sweep for the analyses exploring childcare in infancy, and at the second sweep when exploring childcare between 9 months and 3 years.

*Analysis*

*Childcare and obesity at 3 years*. We used Poisson regression to estimate unadjusted risk ratios (RRs) for being overweight at age 3 years, according to whether the child was cared for in informal and formal childcare between the age of 9 months and 3 years, compared with those who were cared for only by a parent. We then calculated adjusted RRs (aRRs), controlling for maternal pre-pregnancy overweight, the mother's ethnicity, number of children living in the household, whether the mother smoked during pregnancy, the child's birthweight *z*-scores and maternal age at first live birth.

These analyses were then repeated separately for children cared for in childcare for 10–30 h a week (part time) and $\geqslant$31 h a week (full time), to examine whether the risk of obesity was different for children spending more or less time in childcare. We next repeated the analyses for each stratum of the socio-economic measures to explore the association between childcare and obesity in different socio-economic groups.

*Infant feeding as a mediator.* To explore whether infant feeding (breastfeeding at $\geqslant$4 months and introducing solids at $\geqslant$4 months) mediates the association between childcare and overweight, we first estimated RRs for being overweight at age 3 years according to childcare use before the age of 4 months. We calculated unadjusted RRs for overweight according to childcare type, and then we controlled for the same confounding characteristics used previously and also lone parenthood, NS-SEC and maternal education (as we did not stratify by these measures in this particular analysis). We next added breastfeeding and introduction of solids into the model, with the assumption that any changes to the risk ratios for being overweight or obese would indicate potential mediation. We also repeated the analysis, limiting it to those children who had been cared for in the same childcare type at the age of 4 months and 3 years (to limit the influence of subsequent childcare types).

All analyses were conducted in STATA/SE 10.0 (Stata Corporation, College Station, TX, USA), using survey commands to take into account the sampling design and attrition at the second sweep. Data were obtained from the UK Data Archive, University of Essex in April 2008.

## Results

*Description of the cohort*

Between birth and 4 months of age, 6% of children were cared for in informal childcare for at least 10 h a week and 2% were cared for in formal childcare (Table 1). At the age of 3 years, almost one-quarter of children had been cared for in informal childcare since the previous sweep (at age 9 months), and three-quarters of informal carers were grandparents. Just over one-fifth had been cared for in formal childcare. Approximately one-quarter of children were overweight or obese at age 3 years. One-third of infants had been breastfed for at least 4 months, and two-thirds were introduced to solids no earlier than 4 months of age. The socio-demographic profile of the cohort was as expected, given the sample design, with relatively greater numbers from less-advantaged backgrounds.

*Childcare and obesity at age 3 years*

Table 2 provides the risk of overweight for children who were cared for in informal and formal childcare, compared with those who were cared for only by a parent. Unadjusted and adjusted RRs are presented overall, according to hours spent in childcare per week, and stratified by the measures of socio-economic background.

**Table 1** Proportion of children according to childcare type, infant feeding and weight status, and socio-demographic characteristics

| | *Weighted %* | N |
|---|---|---|
| *Childcare type: birth–4 months* | | |
| Parent | 91.7 | 13 089 |
| Informal | 6.2 | 964 |
| Formal | 2.1 | 277 |
| *Childcare type: 9 months–3 years* | | |
| Parent | 55.7 | 7394 |
| Informal | 22.5 | 3274 |
| Grandparent | 17.6 | 2532 |
| Other | 4.9 | 742 |
| Formal | 21.9 | 2840 |
| *Weight status* | | |
| Normal weight | 77.0 | 10 088 |
| Overweight | 18.0 | 2407 |
| Obese | 5.1 | 692 |
| *Breastfeeding duration* | | |
| Never | 30.4 | 4614 |
| <4 months | 36.7 | 5343 |
| ⩾4 months | 32.8 | 4477 |
| *Introduction of solids (age)* | | |
| < 4 months | 35.4 | 5059 |
| ⩾4 months | 64.6 | 9363 |
| *Birthweight* | | |
| Low (<2.5 kg) | 6.0 | 888 |
| Normal (2.5–4.5 kg) | 92.3 | 13 266 |
| High (>4.5 kg) | 1.8 | 252 |
| *Maternal pre-pregnancy weight status* | | |
| Normal weight | 71.4 | 9575 |
| Overweight/obese | 28.6 | 3973 |
| *Smoked during pregnancy* | | |
| No | 65.4 | 9431 |
| Yes | 34.7 | 4943 |
| *NS-SEC* | | |
| Managerial and professional | 32.5 | 4087 |
| Intermediate | 24.2 | 3033 |
| Routine and manual | 43.3 | 5841 |
| *Maternal education* | | |
| None | 15.3 | 2471 |
| GCSE G–D | 11.0 | 1524 |
| GCSE A*–C | 34.9 | 4855 |
| A levels | 9.7 | 1408 |
| Diploma | 9.4 | 1317 |
| Degree | 17.6 | 2469 |
| Other | 2.2 | 359 |
| *Lone parenthood* | | |
| Couple family | 83.8 | 12 081 |
| Lone parent | 16.2 | 2353 |
| *Area deprivation (national quintiles)*[b] | | |
| Least deprived | 20.4 | 1447 |
| Fourth | 18.4 | 1367 |
| Third | 20.3 | 1637 |
| Second | 18.9 | 1887 |
| Most deprived | 21.9 | 2729 |
| *Ethnicity* | | |
| White British | 86.8 | 12 086 |
| Other white | 2.0 | 260 |
| Mixed | 0.9 | 126 |
| Indian | 1.9 | 365 |
| Pakistani | 4.2 | 897 |
| Black or Black British | 2.6 | 417 |
| Other | 1.6 | 252 |
| *Maternal age at first live birth (years)* | | |
| 14–19 | 18.5 | 2665 |
| 20–24 | 25.6 | 3832 |
| 25–29 | 29.7 | 4049 |
| 30–34 | 20.2 | 2677 |
| 35–39 | 5.5 | 720 |
| 40 plus | 0.4 | 63 |
| *No. of dependent children in household* | | |
| 1 child | 24.5 | 3565 |
| 2–3 children | 66.1 | 9298 |
| ⩾4 children | 9.4 | 1520 |

Abbreviations: BMI, body mass index; GCSE, General Certificate of Secondary Education; NS-SEC, National Statistics Socio-Economic Classification. [b]England only. Missing: Childcare birth–4 months, 104; 9 months–3 years, 926; BMI, 1247; childcare, 926; solids, 12; birthweight, 28; NS-SEC, 176; maternal education, 31; area deprivation, 53; maternal age at first live birth, 428; ethnicity, 31; maternal pre-pregnancy overweight, 886; smoking during pregnancy, 60; no. of children in household, 51.

### *Overall association*

Informal childcare was associated with an increased risk of overweight, both before and after adjustment. There was no significant difference in overweight between children cared for in formal childcare and those cared for only by a parent.

### *Stratified by hours spent in childcare*

When stratifying by hours spent in childcare, the increased risk in informal childcare was only observed for those who were cared for full time. This remained the case in the adjusted analyses.

### *Stratified by socio-economic background*

When stratifying, the elevated risk observed in informal childcare was observed only in the most advantaged groups, before and after adjustment. Children, whose mothers were from managerial and professional backgrounds, were educated to the degree level or above or were living as part of a couple, were more likely to be overweight if they were cared for in informal childcare, compared with children from the same socio-economic strata who were cared for only by a parent. An increased risk of overweight in informal childcare was also observed for children living in the middle quintile of area deprivation. There was no significant difference in overweight between children cared for in formal childcare

**Table 2** Risk ratios for overweight (including obesity) according to childcare type: unadjusted and adjusted RRs

| *Childcare* | *% (N) overweight* | *Unadjusted RR* | *Adjusted RR[a] (95% CI)* |
|---|---|---|---|
| *Overall analysis* | | | |
| Parent only | 22.2 (1520) | — | — |
| Informal | 25.3 (773) | 1.14 (1.04–1.25)* | 1.15 (1.04–1.27)* |
| Formal | 23.2 (617) | 1.05 (0.95–1.15) | 1.08 (0.98–1.20) |
| *Time spent in childcare* | | | |
| Parent only | 22.2 (1520) | — | — |
| Informal P/T | 24.2 (598) | 1.09 (0.99–1.21) | 1.11 (0.99–1.24) |
| Informal F/T | 30.1 (175) | 1.36 (1.16–1.59)* | 1.34 (1.15–1.57)* |
| Formal P/T | 22.5 (452) | 1.01 (0.91–1.13) | 1.08 (0.96–1.21) |
| Formal F/T | 25.5 (165) | 1.15 (0.98–1.35) | 1.11 (0.94–1.31) |
| *Stratified by SES* | | | |
| NS-SEC | | | |
| Routine and manual | | | |
| Parent only | 23.3 (790) | — | — |
| Informal | 25.4 (289) | 1.09 (0.95–1.26) | 1.11 (0.96–1.29) |
| Formal | 27.2 (152) | 1.17 (0.98–1.39) | 1.19 (0.98–1.44) |
| Intermediate | | | |
| Parent only | 19.3 (242) | — | — |
| Informal | 22.6 (193) | 1.17 (0.97–1.42) | 1.16 (0.95–1.42) |
| Formal | 21.5 (121) | 1.11 (0.90–1.37) | 1.10 (0.89–1.37) |
| Managerial and professional | | | |
| Parent only | 22.0 (270) | — | — |
| Informal | 27.2 (266) | 1.24 (1.04–1.47)* | 1.23 (1.02–1.47)* |
| Formal | 22.2 (306) | 1.01 (0.86–1.19) | 1.05 (0.89–1.25) |
| Maternal education | | | |
| None | | | |
| Parent only | 24.6 (385) | — | |
| Informal | 27.1 (69) | 1.10 (0.85–1.43) | 1.17 (0.90–1.52) |
| Formal | 24.7 (55) | 1.01 (0.73–1.39) | 1.11 (0.79–1.56) |
| GCSE D–G | | | |
| Parent only | 25.8 (205) | — | |
| Informal | 27.3 (76) | 1.06 (0.82–1.36) | 1.15 (0.90–1.47) |
| Formal | 28.2 (41) | 1.09 (0.78–1.54) | 0.99 (0.69–1.43) |
| GCSE A*–C | | | |
| Parent only | 21.6 (527) | — | |
| Informal | 24.6 (315) | 1.14 (0.98–1.32) | 1.14 (0.98–1.34) |
| Formal | 23.4 (168) | 1.08 (0.90–1.30) | 1.12 (0.93–1.36) |
| A/AS levels | | | |
| Parent only | 16.8 (98) | — | |
| Informal | 22.7 (84) | 1.35 (0.98–1.86) | 1.25 (0.91–1.71) |
| Formal | 25.4 (71) | 1.51 (1.08–2.12)* | 1.41 (0.99–2.00) |
| Diploma | | | |
| Parent only | 22.5 (107) | — | |
| Informal | 22.6 (87) | 1.01 (0.75–1.36) | 0.99 (0.74–1.34) |
| Formal | 24.7 (79) | 1.10 (0.82–1.47) | 1.13 (0.84–1.54) |
| Degree | | | |
| Parent only | 19.8 (150) | — | |
| Informal | 29.2 (133) | 1.48 (1.19–1.84)* | 1.43 (1.13–1.83)* |
| Formal | 20.4 (192) | 1.03 (0.82–1.29) | 0.99 (0.78–1.26) |
| Lone parenthood | | | |
| Lone parent | | | |
| Parent only | 24.6 (279) | — | — |
| Informal | 25.8 (108) | 1.05 (0.82–1.34) | 1.02 (0.77–1.34) |
| Formal | 26.0 (108) | 1.05 (0.85–1.30) | 1.07 (0.85–1.36) |
| Couple family | | | |
| Parent only | 21.7 (1241) | — | — |
| Informal | 25.2 (665) | 1.16 (1.05–1.28)* | 1.18 (1.06–1.32)* |
| Formal | 22.7 (509) | 1.05 (0.94–1.16) | 1.09 (0.97–1.21) |
| Area deprivation (national quintiles)[b] | | | |
| Most deprived | | | |
| Parent only | 23.2 (349) | | — |
| Informal | 26.6 (92) | 1.15 (0.93–1.42) | 1.19 (0.95–1.50) |
| Formal | 23.3 (76) | 1.00 (0.79–1.28) | 0.98 (0.75–1.29) |
| Fourth | | | |
| Parent only | 24.0 (208) | | — |
| Informal | 27.4 (106) | 1.14 (0.92–1.42) | 1.16 (0.92–1.47) |
| Formal | 25.6 (73) | 1.07 (0.83–1.38) | 1.06 (0.81–1.38) |
| Third | | | |
| Parent only | 20.2 (147) | | — |
| Informal | 27.4 (100) | 1.35 (1.07–1.72)* | 1.37 (1.07–1.75)* |
| Formal | 22.9 (72) | 1.13 (0.86–1.49) | 1.13 (0.86–1.49) |
| Second | | | |
| Parent only | 18.8 (112) | | — |
| Informal | 23.4 (61) | 1.25 (0.94–1.65) | 1.17 (0.87–1.57) |
| Formal | 21.9 (71) | 1.16 (0.89–1.53) | 1.11 (0.84–1.48) |
| Least deprived | | | |
| Parent only | 20.6 (129) | — | — |
| Informal | 19.3 (43) | 0.94 (0.69–1.29) | 0.99 (0.71–1.36) |
| Formal | 20.6 (85) | 1.00 (0.78–1.28) | 1.07 (0.83–1.39) |

Abbreviations: BMI, body mass index; CI, confidence interval; GCSE, General Certificate of Secondary Education; NS-SEC, National Statistics Socio-Economic Classification; RR, risk ratio; SES, socio-economic status. [a]Adjusting for maternal age, ethnicity, number of children in household at age 3 years, pre-pregnancy maternal overweight, birth weight and smoking during pregnancy. [b]England only. *$P \leqslant 0.05$. Missing: BMI, 1247; childcare, 926; NS-SEC, 176; maternal education, 31; area deprivation, 53; maternal age at first live birth, 428; ethnicity, 31; maternal pre-pregnancy overweight, 886; birthweight *z*-score, 169; smoking during pregnancy, 60; no. of children in household, 51.

and those cared for only by a parent in almost all of the strata.

### *Care by grandparents*

When differentiating between care by grandparents and other informal care, we found that the increased risk of overweight was only significant in children who were cared for by grandparents (Table 3). When the analysis was stratified by time spent in childcare, both part-time and full-time care by grandparents was associated with an increased risk of overweight, and an increased risk also emerged for other informal childcare, if it was full time.

### *Childcare and infant feeding at 4 months, and obesity at 3 years*

Table 4 presents the RRs for being overweight according to childcare use before the age of 4 months for at least 10 h a

week. In the unadjusted analyses, children who were cared for in informal childcare were more likely to be overweight than those who were only cared for by a parent. However, after controlling for confounders the association disappeared and it was not further affected by controlling for infant feeding. Exploring the association in those who had been cared for in the same main childcare type at age 4 months and 3 years indicated that children who had only been cared for in informal childcare were also at an increased risk of overweight when compared with those who had only been cared for by a parent. The size of the increased risk was not altered when controlling for confounders. The association remained after controlling for infant feeding (although with some reduction of power), indicating that the elevated risk experienced by children who have been cared for in informal childcare before age 4 months is not explained by lower rates of breastfeeding or the early introduction of solids.

**Table 3** Risk ratios for overweight (including obesity) according to childcare type, separating grandparent and other informal childcare: unadjusted and adjusted RRs

| *Childcare* | *% (N) obese* | *Unadjusted RR (95% CI)* | *Adjusted RR*[a] *(95% CI)* |
|---|---|---|---|
| *Overall analysis* | | | |
| None | 22.2 (1520) | — | — |
| Grandparent | 25.4 (608) | 1.15 (1.04–1.27)* | 1.18 (1.05–1.32)* |
| Other informal | 24.6 (165) | 1.11 (0.94–1.31) | 1.15 (0.97–1.37) |
| Formal | 23.2 (617) | 1.05 (0.95–1.15) | 1.09 (0.98–1.22) |
| *Time spent in childcare* | | | |
| None | 22.2 (1520) | — | — |
| Grandparent P/T | 24.6 (487) | 1.11 (0.99–1.25) | 1.15 (1.01–1.30)* |
| Grandparent F/T | 29.6 (121) | 1.34 (1.12, 1.59)* | 1.34 (1.12–1.60)* |
| Other informal P/T | 22.5 (111) | 1.01 (0.83–1.24) | 1.07 (0.87–1.32) |
| Other informal F/T | 31.3 (54) | 1.41 (1.09–1.82)* | 1.40 (1.06–1.86)* |
| Formal P/T | 22.5 (452) | 1.01 (0.91–1.13) | 1.09 (0.96–1.23) |
| Formal F/T | 25.5 (165) | 1.15 (0.98–1.34) | 1.13 (0.94–1.34) |

Abbreviations: BMI, body mass index; CI, confidence interval; F/T, full time; NS-SEC, National Statistics Socio-Economic Classification; P/T, part time; RR, risk ratio. [a]Adjusting for maternal age, ethnicity, number of children in household at age 3 years, pre-pregnancy maternal overweight, birth weight, smoking during pregnancy, NS-SEC, maternal education and lone parenthood. *$P \leqslant 0.05$. Missing: BMI, 1247; childcare, 926; NS-SEC, 176; maternal education, 31; maternal age at first live birth, 428; ethnicity, 31; maternal pre-pregnancy overweight, 886; birthweight *z*-score, 169; smoking during pregnancy, 60; no. of children in household, 51.

## Discussion

*Strengths and limitations*

We explored the association between childcare and overweight and in relation to infant feeding in a contemporary UK setting. To our knowledge, this is the first study to have explored this association. Furthermore, we analysed the association in different socio-economic groups, and we differentiated between formal and informal types of childcare, including care by grandparents. It is possible that the small sample sizes in some of the subgroups limited our ability to detect an effect.

We were able to use an objective measure of overweight. Childcare was based on maternal report and this may be subject to recall bias. Furthermore, the measure of childcare that we used was based on the main childcare type used for the longest period of time. Approximately 12% of mothers who reported using childcare had used two main arrangements since the child was of age 9 months, and 28% used subsidiary childcare in addition to the main childcare. We repeated the overall analyses between childcare and overweight for those who used only one type of childcare and the unadjusted and adjusted associations were very similar to those reported in this study, although with some reduction in power (data not shown). Mothers were not asked about diet or physical activity in either of the

**Table 4** RRs for overweight (including obesity) according to childcare use in the first 4 months of life: unadjusted and adjusted RRs and controlling for infant feeding as a potential mediator

| | *%(N) overweight* | *Unadjusted RR (95% CI)* | *Adjusted RR (95% CI)*[a] | *Adjusted RR*[a] *+ breastfeeding duration*[b] *(95% CI)* | *Adjusted RR*[a] *+ breastfeeding duration +introduction of solids*[c] *(95% CI)* |
|---|---|---|---|---|---|
| *Childcare use at 4 months (all children)* | | | | | |
| None | 22.8 (2784) | | | | |
| Informal | 26.6 (235) | 1.16 (1.01–1.33)* | 1.08 (0.92–1.27) | 1.06 (0.90–1.24) | 1.05 (0.90–1.24) |
| Formal | 23.7 (58) | 1.08 (0.84–1.38) | 1.03 (0.79–1.34) | 1.03 (0.79–1.33) | 1.02 (0.79–1.33) |
| *Childcare use at 4 months* (*limited to children whose childcare type had not changed by age 3 years)*[d] | | | | | |
| None | 22.1 (1464) | | | | |
| Informal | 26.8 (147) | 1.22 (1.03–1.43)* | 1.21 (1.01–1.45)* | 1.19 (1.00–1.43)* | 1.18 (0.99–1.41) |
| Formal | 23.7 (50) | 1.07 (0.83–1.40) | 1.09 (0.82–1.43) | 1.09 (0.82–1.43) | 1.07 (0.82–1.41) |

Abbreviations: BMI, body mass index; CI, confidence interval; NS-SEC, National Statistics Socio-Economic Classification; RR, risk ratio. [a]Adjusting for maternal age at first live birth, ethnicity, number of children in household at age 9 months, pre-pregnancy maternal overweight, birthweight, smoking during pregnancy, NS-SEC, lone parenthood and maternal education. [b]Categorized as never breastfed, breastfed for $<4$ months and breastfed for $\geqslant 4$ months. [c]Whether the mother introduced solids after the age of 4 months (yes, no). [d]In order to limit the potential effect of subsequent childcare types. *$P \leqslant 0.05$. Missing: BMI, 1247; childcare, 926; NS-SEC, 176; maternal education, 31; maternal age at first live birth, 428; ethnicity, 31; maternal pre-pregnancy overweight, 886; birthweight, 169; smoking during pregnancy, 60; breastfeeding duration, 15; age at which solids introduced, 12; no. of children in household, 51.

interviews and hence we were unable to explore whether these varied by childcare type. We were also unable to analyse the characteristics of the informal carers, including grandparents.

*Comparison with other findings*

Similar to ours, three studies based in the United States reported that those who were cared for in informal childcare were at a higher risk of overweight than children who were cared for only by a parent. One study analysed the effect of childcare type upon infant feeding habits and weight gain at age 9 months and found that infants who were cared for in informal childcare had gained more weight by the age of 9 months.[13] The second study explored the association between weight when entering kindergarten and childcare use over the previous year and found that those cared for in informal care were more likely to be obese.[18] A further US study exploring place of childcare found that children who were cared for in someone else's home (but not in a centre or by a carer in the child's own home) between birth and 6 months had greater weight-for-length at age 1 year and higher body mass index *z*-scores at age 3 years.[14] The researchers concluded that this may be because care in someone else's home is less likely to be regulated than childcare centres and that carers are less likely to follow parents' feeding advice or requests than if it was in the parents' home. A US-based study that explored the association between childcare between the ages of 3 and 5 years and obesity at age 6–12 years[17] found that those who were cared for in centre-based childcare were less likely to be obese than children who were cared for either only by a parent or by an informal carer. The decreased risk observed in formal childcare may be explained by the inclusion of informal childcare in the baseline.

A review of risk factors for childhood obesity[11] identified two studies of the same Japanese cohort that explored the effect of nursery school attendance and being cared for by a father or grandparent on overweight in preschool children and neither found that childcare was linked with overweight.[15,16] However, one of these[15] found that children who were cared for only by their mother or who attended kindergarten were less likely to snack at irregular times (when compared with being cared for by the father or a grandparent) and those who were cared for only by their mother were more physically active. We were able to explore informal childcare in more detail and found that children cared for by grandparents appeared to be at a greater risk than those looked after by other informal carers. However, when we stratified by time spent in childcare, the increased risk was observed in full-time childcare provided by other informal carers as well as part- and full-time care by grandparents.

Two studies explored the association between childcare and overweight by measures of poverty and income and neither found a significant interaction.[17,18] However, we explored the association within the strata for each of the socio-economic measures and found that children whose mothers had higher educational qualifications, were from managerial and professional backgrounds or who lived with a partner were at increased risk of obesity if they were looked after in informal childcare, whereas those from less-advantaged backgrounds were not. These differences were not observed in the analyses stratified by area deprivation, implying that the differential effect of childcare operates at a household rather than area level.

Two of the studies reported in this study explored infant feeding as a potential mediator between childcare and weight status.[13,14] The first study concluded that infant feeding did not mediate the association between childcare and weight gain in infancy, although using cross-sectional data may have limited its ability to detect such an effect.[13] The second study found that the association between care in someone else's home in the first 6 months of life and adiposity at age 1 and 3 years was mediated slightly by breastfeeding duration.[14] When we explored infant feeding as a potential mediator between childcare in infancy and overweight at age 3, we found that it did not mediate the association.

*Implications for policy, practice and further research*

The current UK government childcare strategy aims to increase the proportion of childminders who are registered and therefore regulated.[25] However, the majority of informal carers in this study were grandparents (and not unregulated childminders), and this is confirmed by other national data.[26,27] Free formal childcare places are available to all children aged 3–4 years for 12.5 h a week,[25] and this is to be extended to 15 h a week by 2010.[28] Parents of preschool children may find it difficult to find or afford formal childcare that 'wraps around' this free quota,[29] and hence may turn to family members for help. It is well recognized that parents value grandparental care and consider it to be the best alternative to full-time parental care, particularly with respect to the emotional well-being of young children.[30] Our study focused on one aspect of children's physical well-being and found that being cared for by an informal carer may increase the risk of being overweight. Efforts to provide informal carers with relevant support and information are therefore necessary. A recent announcement to provide grandparents with National Insurance credits for caring for grandchildren under the age of 13 years for at least 20 h a week from 2011[31] provides a potential opportunity for such health promotion. Further research analysing childcare practices used in different types of childcare, particularly with respect to diet and physical activity and in different socio-economic groups, may help to target health promotion more effectively.

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## Conflict of interest

The authors declare no conflict of interest.

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## Appendix

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# **Appendix 2:** Supplementary information for Chapter 2 "Methods"

## Appendix 2.1: Policy areas, aims and programmes/schemes

This section of the appendix provides a full list of the policies which were identified in the search described in Chapter 2 (2.2.1).

Policy areas are shown in bold, listed below these are policy aims in italics and then under these are programmes or schemes, shown in normal font. Some of these programmes may fall under several different policy aims and areas; they are not always repeated accordingly in this menu. Where a policy area, aim or programme falls under a Public Service Agreement (PSA) target, this is shown in brackets.

**Child poverty (PSA 8, 2008-2011)**
**Increase benefits*
Increase in the value of Child Benefit
Child Tax Credit
Job Grant
National Minimum Wage
New Deals
Working Tax Credit
From 2009 mothers to be will be eligible for Child Benefit from week 29 of their pregnancy.
Child Trust Fund

***Reduce income inequalities**
National Minimum Wage
New Deals
Working Tax Credit etc

**Maximise employment opportunity (PSA 9, 2008-2011)**
**Increase employment in general (PSA 9, indicator 1)*
Action Team for Jobs
Adult Basic Skills
Basic Employability Training
Employer Training Pilots Employment Zones
Freshstart
JobCentre Plus
JobPoints
Progress2work
Skills for Life Strategy
Step-Up
Work Based Learning for Adults
Worktrain
Phoenix Fund

**Increase employment in all parents/mothers (PSA DWP, 2005-2008)*
Increase availability and uptake of child care (PSA DFES, 2005-2008)
Work and families Act (maternity and paternity leave)
Pathways to Work
New Deal for partners (encouraging partners of benefit recipients into work)
**Increase employment in lone parents (PSA 9, indicator 2)*
Lone Parent Run On
New Deal for Lone Parents
*Increase employment in disabled parents*
New Deal for Disabled People
**Increase availability and quality of child care*
Child care Act and 10 year child care strategy

**Health and health inequalities (PSA 12, 2008-2011)**
*Improve diet and nutrition*
5 A Day Programme – including the School Fruit and Vegetable Scheme
Action on Food Promotion to children
Breastfeeding *(PSA 12, indicator 1)*
Advertising of formula milk
Reform of Welfare Food Scheme (Healthy Start)
**Improve maternity services*
Choice of how to access maternity care
Choice of type of antenatal care *(PSA 19, indicator 4)*
Choice of place of birth
Choice of place of postnatal care
**Increase support/access to information for parents*
Extended schools
Health-led parenting programme
Children's centres (Sure Start)
Care Direct
NHS Direct
Health Action Zones
Children's Fund
Healthy Living Centres
Parent Know-How
Parent's Charter
Parent's Panel
Expert parenting advisers
*Infant mortality (Health inequalities target; PSA DH, 2005-2008)*
**Reduce under 18 conceptions (PSA 14, indicator 4)/ increase support for teenage parents*
Teenage Pregnancy Strategy
Sure Start Plus
Health in pregnancy grant
*Child health promotion programme*
Increase immunisation uptake
*Reduce smoking (PSA 18, indicator 3 in all adults, Health Inequalities target in pregnancy)*
Smoking- cessation support, passive smoking, advertising, campaigns and education
*Reduce obesity (PSA 12, indicator 3)*

Improvements in labelling, awareness campaign, support to lose weight, promotion to children, Healthy schools, encouraging activity, early years support, neighbourhood environment
*Safety*
Hospital admissions caused by unintentional and deliberate injuries to children and young people *(PSA 13, indicator 3)*
Home safety equipment scheme
20mph zones
Home Zones
Preventable child deaths as recorded through child death review panel processes *(PSA 13, indicator 4)*
*Physical activity*
£225 million over next 3 years to create safer places to play, including 3500 playgrounds to be rebuilt or renewed.
Ban on selling school playing fields
Home Zones
Extended schools in disadvantaged areas

*__Supporting families/parents__
Children's Fund
Family Support Fund (for Sure Start families)
Marriage and relationship support Programme
Parenting Programme
Sure Start (and continued roll out as Children's Centres)
Sure Start Plus
Parentline plus
Homestart
Parent Know-How
Parent's Charter
Parent's Panel
Encouraging father involvement
Expert parenting advisers
One Plus One

**Housing (PSA 20, 2008-2011~supply and affordability)**
**Improve quality of social housing*
Owner Improvement & Maintenance initiatives
Supporting People (for vulnerable people)
**Increased mobility of social housing tenants*
Housing and Employment Mobility Service (HEMS)

**Neighbourhood environment**
**Improve safety (road, home)*
Home safety equipment scheme
20mph zones
Home Zones
**Safer communities (PSA 23, 2008-2011)*
Safer Communities Initiatives
Tackling Anti-Social Behaviour'
Anti-Social Behaviour Unit-launched 'Together:
Neighbourhood Managements and Warden scheme
Communities against Drugs

Safer Communities Supported Housing Fund
**Improve physical environment*
Home Zones
Living Spaces
**Improve social cohesion (PSA 24, 2008-2011)*
Community Cohesion Pathfinders
Community Empowerment Networks
**Increase community participation (PSA 24, 2008-2011)*
Sport Action Zones
Positive Futures (targeted)
Tenant Participation Initiatives
*Healthier communities*
National Strategy for Neighbourhood Renewal
**Reduce area level deprivation*
New Deal for Communities (targeted)
Employment Zones
Action Team for Jobs
Child care
Sure Start
**Funding for local organisations*
Community Learning Chests
Local Network fund for children and young people
Community Empowerment Fund
Community Champions fund

**Child development/education**
*Raise educational achievement (PSA 10, 2008-2011) and narrow inequalities (PSA 11, 2008-2011)*
Curriculum Guidance for the Early Year's Foundation Stage
Extended schools
15 hours per week of free and flexible early education for 3-4 year olds. Extended to 20,000 2 year olds living in disadvantaged areas.
Bookstart

## Appendix 2.2: Ratings for policies and health measures

### Health menu

| | Priority | Degree of inequalities | Longitudinal impact | Feasibility | Intervening variables/proxies* | Evidence base | Amenable to change | Expertise | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Pre-term birth** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | o | ✓ | **7** |
| **Teenage conceptions** | ✓ | ✓ | ✓ | o | o | ✓ | ✓ | o | 5 |
| **Birthweight** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | o | ✓ | **7** |
| **Infant mortality** | ✓ | ✓ | x | ✓ | ✓ | ✓ | ✓ | ✓ | **7** |
| **Child mortality** | ✓ | x | x | o | ✓ | ✓ | ✓ | ✓ | 4 |
| **Emotional health/wellbeing** | ✓ | ✓ | ✓ | o | ✓ | ✓ | ✓ | x | 6 |
| **Unintentional injury** | ✓ | ✓ | o | ✓ | ✓ | ✓ | ✓ | o | **6^** |
| **Infectious diseases** | o | o | o | ✓ | o | ✓ | ✓ | x | 3 |
| **Cancer** | o | x | o | o | o | o | o | x | 0 |
| **Obesity** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | 8 |
| **Diabetes** | o | x | ✓ | ✓ | ✓ | ✓ | o | x | 4 |
| **Nutrition** | o | ✓ | ✓ | o | o | ✓ | ✓ | ✓ | 5 |
| **Physical activity** | ✓ | ✓ | o | o | o | ✓ | ✓ | ✓ | 5 |
| **Breastfeeding** | ✓ | o | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | **7** |
| **Smoking in pregnancy** | o | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | **7** |
| **Immunisation** | ✓ | ✓ | ✓ | ✓ | o | ✓ | ✓ | ✓ | **7** |
| **Alcohol in pregnancy** | o | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | **7** |

*where necessary. If not necessary then assigned with ✓
✓ = High rating; 0 = Moderate rating; ✗ = Low rating
Totals were calculated by totalling the number of ticks.
Those shown in bold were shortlisted
^ Shortlisted because scored 6, received no crosses and was high priority

## Policy menu

| | Target group | Evidence base | Longevity | Policy aim | Policy mechanism | Feasibility | Health affects | Total |
|---|---|---|---|---|---|---|---|---|
| **Increase benefits** | o | o | ✓ | ✓ | o | o | ✓ | 3 |
| **Reduce income inequality** | o | o | ✓ | ✓ | ✓ | o | ✓ | 4 |
| **Increase employment in general** | x | o | ✓ | o | ✓ | ✓ | o | 3 |
| **Increase employment in all parents/mothers** | o | o | o | o | ✓ | ✓ | ✓ | 3 |
| **Increase employment in lone parents** | o | o | ✓ | ✓ | ✓ | ✓ | ✓ | **5** |
| **Increase employment in disabled parents** | o | o | ✓ | o | ✓ | o | o | 2 |
| **Increase availability and quality of child care** | ✓ | ✓ | ✓ | o | ✓ | ✓ | ✓ | **6** |
| **Maternity services** | ✓ | o | ✓ | o | ✓ | o | ✓ | 4 |
| **Increase support/access to info for parents** | o | o | ✓ | o | ✓ | x | o | 2 |
| **Reduce under 18 conception** | o | o | ✓ | o | ✓ | o | x | 2 |
| **Increase support for teenage parents** | o | o | ✓ | o | ✓ | o | x | 2 |
| **Supporting families/parents** | o | o | o | o | ✓ | o | ✓ | 2 |
| **Improve quality of social housing** | o | o | o | ✓ | ✓ | ✓ | o | 3 |
| **Increased mobility of social housing tenants** | o | o | o | ✓ | o | o | o | 1 |
| **Safety (road, home)** | o | o | ✓ | ✓ | ✓ | ✓ | o | 4 |
| **Safer communities** | x | o | o | o | ✓ | o | o | 1 |
| **Improve physical environment** | x | o | o | o | ✓ | o | o | 1 |
| **Improve social cohesion** | x | o | o | o | ✓ | o | o | 1 |
| **Increase community participation** | x | o | o | o | ✓ | o | o | 1 |
| **Tackle area level deprivation** | o | ✓ | o | ✓ | ✓ | ✓ | ✓ | **5** |
| **Funding for local organisations** | o | o | o | ✓ | x | x | x | 1 |
| **Raise educational achievement** | o | o | ✓ | ✓ | ✓ | o | x | 3 |

✓ = High rating; 0 = Moderate rating; ✖ = Low rating. Total = number of ticks. Those shown in bold were shortlisted

## Appendix 2.3: Literature search strategies

### Injury

| PubMed | | No. returns |
|---|---|---|
| #1 | "wounds and injuries"[MeSH Terms] AND ("infant"[MeSH Terms] OR "child, preschool"[MeSH Terms]) | 49511 |
| #2 | "accidents"[MeSH Terms] AND ("infant"[MeSH Terms] OR "child, preschool"[MeSH Terms]) | 10620 |
| #3 | #1 OR #2 [review, editorial, letter] | 5829 |
| #4 | "social control policies"[MeSH Terms] | 83652 |
| | **#4 AND #3, after 1980, English, abstracts** | **33** |
| | **#3 after 1980, English, abstracts (first 20% reviewed)^** | **2219 (444 scanned)** |
| EMBASE | | |
| #1 | Accident (abstract) | 18050 |
| #2 | Injury (abstract) | 196632 |
| #3 | Preschool-child (anywhere) | 97963 |
| #4 | #1 OR #2 | |
| #5 | #3 AND #4 | 2270 |
| | **#5AND Review (document type)** | **84** |
| PsychInfo and IBSS | | |
| #1 | Accident OR injury | 34274 |
| #2 | child | 256414 |
| #3 | #1 AND #2 | 2956 |
| | **#3 AND review** | **344** |
| ChildData* | | |
| | Key word search : **accidents OR injuries AND review** | Approx 3000 |
| | | **Reduced to 35 based on titles** |

Limits for all of the above: human, published since 1980, English, Abstracts
^ the first 20% of abstracts from #3 were also scanned, to see if excluding "social control policies" produced any additional relevant reviews. It did not, and so the remaining 80% were not scanned (20% cut off was chosen arbitrarily).

## Childcare

| PubMed | | No. returns |
|---|---|---|
| #1 | "Child day care centers"[MeSH Terms] OR child day care centre[Text Word] | 1528 |
| #2 | ("child welfare"[TIAB] NOT Medline[SB]) OR "child welfare"[MeSH Terms] OR "child care"[MeSH | 52420 |
| #3 | "child care" ("child care"[All Fields])- N.B. need speech marks | 2705 |
| #4 | childcare[All Fields] | 421 |
| #5 | ("day care"[MeSH Terms] OR day care[Text Word]) | 4280 |
| #6 | Day care [limit MeSH terms] | 1392 |
| #7 | #5NOT #6 | 2888 |
| #8 | daycare[All Fields] | 308 |
| #9 | #1 OR #2 OR #3 OR #6 OR #7 | 5635 |
| #10 | "health"[MeSH Terms] | 68477 |
| #11 | "Behaviour and Behaviour mechanisms"[MeSH Terms] | 574105 |
| #12 | wellbeing[Title/Abstract] | 1410 |
| #13 | #9AND #10 OR #11 OR #12 | 2790 |
| **#14** | [review only] | **288** |
| EMBASE | | |
| #1 | Childcare OR child-care | 23028 |
| #2 | Daycare OR day-care | 4677 |
| #3 | Nursery | 2935 |
| #4 | Health OR wellbeing OR well-being | 1128083 |
| #5 | Child-development | 15105 |
| #6 | Review (article type) | 752092 |
| #7 | 1 OR 2 OR 3 | |
| #8 | 4 OR 5 | |
| | **7 AND 8 AND 6** | **3216** |
| Psychinfo and IBSS | | |
| #1 | Childcare OR child-care | 8004 |
| #2 | Daycare OR day-care | 4361 |
| #3 | Nursery | 3974 |
| #4 | Health OR wellbeing OR well-being | 1128083 |
| #5 | Child-development | 15105 |
| #6 | 1 OR 2 OR 3 | |
| #7 | 4 OR 5 | |
| #8 | 7 AND 8 | |
| | **#9 AND review** | **328** |
| ChildData* | | |
| | Keyword search using: **daycare and health and review** | **350** |

Limits for all of the above: human, published since 1980, English, Abstracts.

*ChildData is catalogue of books, reports and journal articles, held by the National Children's Bureau (NCB)

## Appendix 2.4: Supplementary information for the injury and childcare variables

### INJURY QUESTIONS

#### *1. Birth to 9 months*

Most babies have accidents at some time. Has ^Jack ever had an accident or injury for which ^he has been taken to the doctor, health centre, or hospital?

IF YES: How many accidents?

^*What* sort of accident or injury was it?
1 Loss of consciousness
2 Bang on the head
3 Broken bone
4 Swallowed object
5 Swallowed household cleaner/other poison/pills
6 Cut needing stitches
7 Cut or graze
8 Burn or scald
9 Something stuck in eye, throat, nose, ear or other part of body
10 Animal or insect bite or sting
95 other sort of accident or injury

How many months old was ^Jack when this accident happened?

Did ^*Jack* go to hospital?
IF YES: Was this just to casualty or was ^*he* admitted to a hospital ward?

#### *2. Nine months to 3 years*

Most children have accidents at some time. Has ^Jack ever had an accident or injury for which ^he has been taken to the doctor, health centre, or hospital?
IF YES: How many accidents?

Thinking about the most severe (or only) accident or injury:

What sort of accident or injury was it?
1 Loss of consciousness/knocked out
2 Bang on the head Injury to head without being knocked out
3 Broken bone or fracture
4 Near drowning
5 Swallowed household cleaner/other poison/pills
6 Swallowed object
7 Cut needing stitches or glue
8 Injury to mouth or tooth
9 Burn or scald
10 Other sort of accident

How old was ^Jack when this accident happened?
Did ^Jack go to hospital?

IF YES: Was this just to casualty or was ^*he* admitted to a hospital ward?

Where did the injury happen?
1 Own home
2 Someone else's home
3 Garden
4 Nursery or playgroup
5 Playground or park
6 Road - as a pedestrian/in a buggy/on a trike etc.
7 Road - as a passenger
8 Other place

**CONSTRUCTION OF THE CHILDCARE VARIABLE**

A range of questions were asked in the MCS1 and MCS2 surveys about childcare type, intensity and duration. The questions used to derive this information were different at the two sweeps. This appendix demonstrates how the information collected was used to construct summary childcare variables for MCS1 and MCS2, for the purpose of this programme of research.

Variables shown in bold were derived by me for the purpose of this project, and those in italics were included in the original dataset and constructed by CLS.

## *1. Birth to 9 months*

### 1.1 Main childcare variable

The childcare variable at MCS1 (**amaincc**) was designed to measure any regular exposure to non-parental care between birth and 9 months. It was constructed using questions about regular childcare used by mothers when they were at work or studying (where applicable), and at all others times.

Variables used to create **amaincc**:
*amcawma* Mothers were asked if they used childcare when they were working or in full-time study (if applicable). Multiple responses were permitted (amcawmaa - amcawmag).
*ammacaa0* This variable was created by CLS to summarise what the main childcare was when at work.

*amotlm0*a All mothers were also asked if they used any regular childcare at all other times.

1. **amaincc** took the values of *amcawma*. In cases where the main childcare (*ammacaa0*) was the mother, her partner, or the baby's non-resident parent, then the variable was replaced using the second and third responses to the original question (*amcawma-c*).
2. **amaincc** was then replaced with childcare used at other times (amotlm0a) for mothers who did not work, or who worked but reported not using non-parental childcare in *ammacaa0* and *amcawmb-c*.

Responses were collapsed into a simple childcare variable which consisted of "none" (parent or partner looks after child), "informal" (relative, friend, neighbour, unregistered childminder) and "formal" (nanny, nursery, registered childminder). If childcare type was stated to be 'other type' it was assigned as missing.

Table 2A1 shows how the variable was collapsed in detail.

**amainccdet** A detailed childcare variable was also constructed, comprising "none", "non-resident parent", "grandparent", "other relative, friend, neighbour", "nanny or au pair", "registered childminder", "unregistered childminder/babysitter", "work place/LA nursery", "private nursery", "other". This variable was not used in any of the analyses but used to construct variables at the second sweep (where feed forward information was required).

Table 2A1 – Construction of **amaincc** using *ammacaa0*, *amcawma*, *amotlm0a*

| **amaincc** | ***ammacaa0, amcawma, amotlm0a*** |
|---|---|
| None | • respondent his/herself<br>• husband/wife/partner<br>• baby s non-resident father/mother |
| Informal | • your mother<br>• your father<br>• your partner's mother<br>• your partner's father<br>• baby's non-resident father's/mother's mother<br>• baby's non-resident father's/mother's father<br>• other relative<br>• friend/neighbour<br>• unregistered childminder |
| Formal | • registered childminder<br>• live-in nanny/au pair<br>• other nanny/au pair<br>• workplace/college nursery/crèche<br>• local authority day nursery/crèche<br>• private day nursery/crèche |
| missing | • other |

## 1.2 Childcare commencing before age of 4 months and lasting at least 10 hours a week

This variable (**amaincc4mth10**) was constructed for the breastfeeding analysis- which explored whether childcare lasting at least 10 hours a week and commencing before the age of 4 months was associated with the likelihood of breastfeeding for at least 4 months (Chapter 7). A 10 hour cut off was chosen because it was thought that childcare lasting less than 10 hours a week would be likely to have a minimal impact on diet and physical activity.

Variables used to create amaincc4mth10:
*amcahr00* Mothers were asked, on average, how many hours the child spent per week being looked after by someone other than the mother, her partner, or the child's father (resident or non-resident). Responses were given in whole hours and referred to all non-parental care collectively and were not broken down for each of the childcare responses given in *amcawma* and *amotlm0a*.
*amagola0* Mothers were also asked what age the child was when they were first regularly looked after by someone else other than a parent or the mother's partner.

Mothers who used non-parental care gave their response in weeks (*amcosw00*) or months (*amolmta0*), unless the childcare had commenced since birth. *amolmta0* was divided by 4.3 to be compatible with *amcosw00.* Responses referred to when any non-parental care first commenced, and so may not necessarily refer to the main childcare type represented by **amaincc**.

**amaincc4mth10** took the values of **amaincc**, and was then reclassified as 'none' if it lasted, on average, for less than 10 hours a week using *amcahr00* or after the age of 4 months using *amagola0*.

Mothers who reported using non-parental care in **amaincc**, but did not respond to *amcahr0*0 and *amagola0* were classified as missing in **amaincc4mth10**.

Part-time and Full-time

A further variable was derived for the breastfeeding analysis, using the childcare variable (**amaincc4mth10**) and the hours variable (*amcahr00*), to represent part-time (10-30 hours per week) and full-time (31 hours plus per week) childcare.

### 1.3 Strengths and limitations of the MCS1 childcare variables

**amaincc** refers to any regular exposure to non-parental care. However it only represents the first type of reported non-parental care and approximately one third of infants who were cared for in informal or formal childcare experienced more than one childcare arrangement.

**amaincc4mth10** also has these limitations. In addition, the variable measuring hours spent in non-parental care was not limited to the main type of non-parental care that **amaincc** represents, but all non-parental care. Similarly the age at which childcare commenced refers to the first ever regular non-parental care and not necessarily the one measured by **amaincc**. Therefore **amaincc4mth10** measures the main childcare type for children who spent less than 10 hours a week in any type of non-parental care, and for whom their first type of non-parental care commenced before 4 months.

## *2. Nine months to 3 years*

### Main childcare variable

In MCS2 survey, childcare type was derived by feeding forward childcare information from MCS1 (where the same childcare arrangements had continued) and by asking about new childcare arrangements.

Variables used to construct **bmaincc10**:

*bmevcca0* At MCS2, mothers who did not report using childcare at MCS1 were asked if they had ever used childcare arrangements.

*bmmccsa0, bmyccsa0* Mothers who reported using childcare in *bmevcca0* were asked when this arrangement had started (month, year).

*bmsamca0* This question was to check that answers provided at MCS1 (i.e. those who were not asked bmevcca0) if their the recorded answer was correct (for that time period)

*bmclsta0* Those who answered yes at *bmevcca0,* or who reported that their MCS1 answer was wrong (*bmsamca0*) reported childcare type

*bmlstca0* All those who reported using childcare (either in *bmclsta0* or at MCS1) were then asked if the arrangement still going on.

*bmmlsta0, bmylsta0* If the childcare had stopped, then mothers were asked to provide the month and year that it stopped.

*bmothca0* Those who said their main childcare had stopped were then asked if they had started using a replacement childcare type.

*bmypca0* If mothers had started using a replacement childcare, then they reported the childcare type.

*bmcstma0, bmcstya0* The month and year that the replacement childcare had started was also reported

*bmstlca0* Mothers were asked if this replacement childcare was still going on

*bmcenma, bmcenya* Mothers who reported that the replacement childcare had stopped, were asked to give the month and year that it had stopped

a*hidty00, ahidtm00* MCS1 interview date

*bhidty00, bhidtm00* MCS2 interview date

*bdobm, bdoby* Cohort child's month and year of birth

Childcare type was assigned in different ways for different groups:

1. Mothers who reported having never used childcare at MCS1 (**amaincc)** and reported at MCS2 that this hadn't changed were classified as 'none'; as were those who did not provide information at MCS1 and said they had never used childcare at MCS2 (*bmevcca0).*

2. If main childcare was still continuing:
    a. If the childcare question was answered at MCS1 (**amaincc)**, was correct (*bmsamca0)*, and was still continuing at MCS2 (*bmlstca0)*- **amaincc** was used
    b. If childcare was reported at MCS2 (*bmclsta0)* and was still continuing at MCS2 (*bmlstca0)*- this childcare type was assigned using *bmclsta0* and the same breakdown as **amaincc** - see Table 2A2
3. If the main childcare stopped and not replaced:
    a. Childcare type was assigned using the MCS1 (**amaincc**) or MCS2 (*bmclsta0*) variable as appropriate
    b. If the childcare stopped (*bmmlsta0, bmylsta0)* before MCS1 interview date (*ahidty00, ahidtm00*) then they were assigned as 'none'
4. If the main childcare stopped and replaced:
    a. Length of time spent in each childcare type was estimated and then the childcare which the child spent the longest period in was assigned.
    b. Weeks spent in childcare were calculated using start and end dates
        i. Start dates were provided for each childcare type, unless childcare type was given at MCS1 in which case MCS1 interview date (*ahidty00, ahidtm00*) was used as the start date.
        ii. End dates were provided for childcare which had stopped and if it was continuing the MCS2 interview date (*bhidty00, bhidtm00*) was used.

If childcare type was stated to be 'other type' in it was assigned as missing.
If childcare was reported as starting before the child's date of birth then childcare was recorded as missing. If start date of childcare was after end date then assigned as missing.

Table 2A2 - Construction of **bmaincc** using *bmclsta0* and **amaincc**

| **bmaincc** | ***MCS1*** | ***MCS2 (bmclsta0)*** |
|---|---|---|
| None | • looking after the child yourself<br>• resident husband wife partner<br>• non-resident partner | • looking after the child yourself<br>• resident husband wife partner |
| Informal | • your mother<br>• your father<br>• your partner's mother<br>• your partner's father<br>• baby's non-resident father's/mother's mother<br>• baby's non-resident father's/mother's father<br>• other relative<br>• friend/neighbour<br>• unregistered childminder<br>• live-in nanny/au pair<br>• other nanny/au pair | • grandparent in my home<br>• other relative (including non-resident partner)<br>• care in grandparent's home<br>• care in other relative's home (including non resident partner)<br>• non-relative (including nannies and au pairs in my home)<br>• non-relative elsewhere (e.g. friend, neighbour in their home) |
| Formal | • registered childminder<br>• workplace/college nursery/crèche<br>• local authority day nursery/crèche<br>• private day nursery/crèche | • childminder<br>• workplace college nursery crèche<br>• private independent day nursery crèche<br>• local authority nursery<br>• nursery school<br>• nursery or reception class<br>• special day school or nursery<br>• playgroup<br>• combined child family centre |
| Missing | • other | • other |

Comparability with MCS1 variable

Because childcare types were coded differently at MCS1 and MCS2, the MCS2 childcare variable (*bmclsta0*) used a slightly different classification to the one used at MCS1. Nanny or au pairs were included in with non relatives at MCS2 and so those children who were looked after by a nanny or au pair at MCS1 and were continuing to do so at MCS2 were re-categorised as informal childcare to keep it consistent. Registered and non-registered childminders were could not be distinguished between at MCS2- so these were categorised as formal childcare at MCS2, but those who were using informal childminders at MCS1 and were still doing so were kept as informal childcare at MCS2. Lastly, non resident partners were included as other relatives at MCS2 whereas at MCS1 they were categorised separately and so were classified as 'none' (since all questions referring to time spent in childcare excluded non-resident partners). These were left as 'none' where derived at MCS1.

**2.2 Main childcare lasting at least 10 hours a week (bmaincc10)**

This variable was constructed for the overweight analysis, which explored whether childcare lasting at least 10 hours a week was associated with the likelihood of being overweight or obese (Chapter 8). The 10 hour cut off was chosen because it was thought that childcare lasting less than 10 hours a week would be likely to have a minimal impact on diet and physical activity.

Variables used to construct **bmaincc10**:

*bmlstha0* For childcare that had stopped, the average number of hours spent in that childcare per week was asked.

*bmhrcwa0* Where the main childcare had stopped, been replaced and then that replacement childcare had stopped, average number of hours per week was reported

*bmhrcsa0* Where main or replacement childcare was continuing, respondents were asked how many hours on average were spent in that childcare when it first started

*bmhrcna0* Where main or replacement childcare was continuing, respondents were asked how many hours on average were spent in that childcare at the time of the MCS2 interview

**bwkhrcc** This variable was created to measure the average number of hours spent in childcare per week.

1. If the main childcare was still continuing, average hours spent in main childcare were estimated by averaging the number of hours spent at the beginning (*bmhrcsa0)* and currently (*bmhrcna0).* A simple average was used since we do not know when the intensity would have changed. NB 67% gave the same number of hours for both). If hours were only given either at the start (*bmhrcsa0)* or currently (*bmhrcna0)* then this variable was used.
2. If main childcare had stopped and been replaced, the length of time spent in first main childcare and the replacement childcare were compared and average hours were used for the type that had been used the longest (*bmlstha0* or *bmhrcwa0*)
3. Where the main childcare had stopped but not been replaced, average hours spent in main childcare per week were used (*bmlstha0*).

**bmaincc10** was created using **bmaincc**, and was reclassified as ‘none’ where the childcare lasted, on average, for less than 10 hours a week (using **bwkhrcc**).

Part-time and Full-time

A further variable was derived for the overweight analysis, using **bmaincc10**, to represent part-time (10-30 hours per week) and full-time (31 hours plus per week) childcare which lasted at least 10 hours a week.

Grandparent and other informal care

An additional variable was also created for the overweight analysis, which differentiated between grandparents and other informal carers, using the detailed childcare variables *bmclsta0* and **amainccdet**.

### 2.3 Strengths and limitations of the MCS2 childcare variables

**bmaincc** refers to the main type of non-parental childcare. Where the main childcare was replaced, the childcare type used for the longest period of time was used. 12% of mothers used two main types of childcare across the period and 28% of mothers used subsidiary childcare in addition to their main informal or formal childcare. Furthermore, **bmaincc** is not directly comparable to the MCS1 variable **amaincc**, due to the different ways in which the questions were worded and how responses were coded.

**bmaincc10** this variable is based on the average number of hours spent per week in the childcare type, and does not account for the variations in intensity that may have occurred over time.

## Appendix 2.5 – Potential confounding factors explored in the MCS analyses

This appendix presents the association between a number of confounding factors and the exposure and outcome variables explored in the MCS analyses presented in Chapters 6-8.

Association between potential confounding factors and the main exposures and outcomes for the childcare analyses (Chapter 6-8)

*Table 2A1: association between injuries and the main potential confounding variables*

| | **Injured Birth-9m** | **Injured 9m-3y** |
|---|---|---|
| **Age at first live birth (yrs)** | | |
| 14-19 | 9.89 (355) | 42.45 (1,116) |
| 20-24 | 8.63 (408) | 38.41 (1,446) |
| 25-29 | 7.50 (371) | 32.97 (1,357) |
| 30-34 | 7.70 (225) | 33.28 (872) |
| 35-39 | 6.73 (54) | 27.96 (204) |
| 40+ | 4.37 (4) | 29.32 (15) |
| P value | 0.0062 | <0.001 |
| **No. children in household** | | |
| 1 | 10.0 (743) | 37.01 (1,340) |
| 2-3 | 7.0 (628) | 35.40 (3,273) |
| 4+ | 4.6 (72) | 33.41 (495) |
| P value | <0.001 | 0.1001 |
| **Ethnicity** | | |
| British White | 8.55 (1,279) | 37.09 (4,507) |
| Other White | 6.54 (24) | 30.92 (76) |
| Mixed | 8.86 (21) | 36.54 (47) |
| Indian | 5.96 (24) | 21.85 (73) |
| Pakistani / Bangladeshi | 3.36 (40) | 25.05 (228) |
| Black of Black British | 6.61 (36) | 25.51 (107) |
| Other | 4.54 (17) | 22.57 (62) |
| P value | <0.001 | <0.001 |
| **Age at 1st/2nd sweep (mths)** | | |
| 8 / =<35 months | 15.34 (9) | 33.01 (126) |
| 9 /36 months | 7.52 (485) | 33.67 (1,479) |
| 10 /37 months | 8.19 (801) | 35.63 (1,731) |
| 11 /38 months | 8.85 (122) | 37.44 (719) |
| 12 /39+ months | 18.69 (26) | 38.07 (1,053) |
| P value | 0.0001 | 0.0157 |

*Table 2A2: association between childcare and the main potential confounding variables*

| | **Birth -9 months** | | | **9 months- 3 years** | | |
|---|---|---|---|---|---|---|
| **Age at first live birth (yrs)** | | | | | | |
| | **Parent only** | **Informal** | **Formal** | **Parent only** | **Informal** | **Formal** |
| 14-19 | 63.27 (2,326) | 33.24 (1,242) | 3.49 (112) | 54.32 (1,383) | 28.62 (728) | 17.06 (409) |
| 20-24 | 55.21 (2,729) | 38.40 (1,980) | 6.39 (284) | 47.13 (1,759) | 33.07 (1,244) | 19.8 (670) |
| 25-29 | 43.74 (2,080) | 38.40 (1,970) | 17.86 (793) | 34.25 (1,333) | 35.14 (1,432) | 30.61 (1,107) |
| 30-34 | 40.02 (1,187) | 29.28 (1,007) | 30.71 (869) | 29.14 (729) | 28.66 (793) | 42.2 (1,023) |
| 35-39 | 36.68 (297) | 25.37 (238) | 37.95 (289) | 30.15 (200) | 21.77 (159) | 48.08 (315) |
| 40+ | 44.96 (37) | 15.37 (18) | 39.67 (26) | 28.5 (19) | 18.67 (11) | 52.83 (29) |
| P value | <0.001 | | | <0.001 | | |
| **No. children in household** | | | | | | |
| 1 | 38.06 (2290) | 42.01 (3416) | 19.93 (1283) | 27.05 (907) | 39.71 (1,398) | 33.24 (1,079) |
| 2-3 | 56.25 (5117) | 30.02 (2864) | 13.73 (1056) | 41.85 (3,770) | 29.77 (2,781) | 28.39 (2,332) |
| 4+ | 71.33 (1059) | 28.83 (369) | 4.9 (52) | 65.72 (974) | 18.48 (270) | 15.8 (210) |
| P value | <0.001 | | | <0.001 | | |
| **Ethnicity** | | | | | | |
| British White | 48.06 (7,073) | 35.3 (5,603) | 16.64 (2,160) | 38.65 (4,429) | 32.44 (3,978) | 28.9 (3,099) |
| Other White | 58.08 (195) | 17.71 (67) | 24.21 (77) | 41.71 (98) | 18.14 (44) | 40.15 (94) |
| Mixed | 59.59 (118) | 30.54 (51) | 9.87 (16) | 51.24 (61) | 23.04 (23) | 25.72 (34) |
| Indian | 48.36 (235) | 41.91 (200) | 9.73 (36) | 42.15 (155) | 30.28 (95) | 27.58 (103) |
| Pakistani / Bangladeshi | 64.08 (801) | 34.62 (441) | 1.3 (10) | 70.76 (630) | 19.51 (159) | 9.73 (87) |
| Black of Black British | 57.34 (387) | 29.14 (176) | 13.52 (61) | 39.79 (156) | 23.47 (86) | 36.74 (145) |
| Other | 63.97 (252) | 26.79 (100) | 9.24 (29) | 55.09 (135) | 20.78 (55) | 24.13 (56) |
| P value | <0.001 | | | <0.001 | | |
| **Age at 1st/2nd sweep (mths)** | | | | | | |
| 8 | 46.61 (41) | 38.6 (39) | 14.8 (8) | 45.74 (174) | 30.91 (130) | 23.35 (72) |
| 9 | 51.85 (3,437) | 34.23 (2,320) | 13.92 (791) | 41.46 (1,768) | 31.6 (1,364) | 26.94 (1,044) |
| 10 | 48.46 (4,870) | 34.76 (3,657) | 16.78 (1,386) | 40.5 (1,901) | 31.18 (1,528) | 28.32 (1,198) |
| 11 | 48.49 (657) | 35.01 (561) | 16.5 (180) | 38.41 (742) | 31.41 (623) | 30.18 (526) |
| 12 | 45.96 (91) | 38.55 (72) | 15.49 (26) | 39.37 (174) | 30.05 (130) | 30.58 (72) |
| P value | 0.0045 | | | P = 0.0709 | | |

The association between childcare before the age of 4 months (which was explored in Chapter 7 in relation to breastfeeding) and maternal age (P<0.001) and ethnicity (P=0.003) were statistically significant and showed similar patterns to those for birth-9mths

*Table 2A3: association between breastfeeding and overweight and the main potential confounding variables*

| | **Breastfeeding** | **Overweight** |
|---|---|---|
| **Age at first live birth (yrs)** | | |
| 14-19 | 12.50 (448) | 23.3 (563) |
| 20-24 | 23.03 (1096) | 24.5 (857) |
| 25-29 | 38.06 (1709) | 23.1 (879) |
| 30-34 | 49.83 (1436) | 20.8 (543) |
| 35-39 | 51.16 (409) | 24.0 (161) |
| 40+ | 47.00 (38) | 11.9 (7) |
| P value | <0.001 | P = 0.0528 |
| **No. children in household** | | |
| 1 | N/A | 22.7 (770) |
| 2-3 | N/A | 23.0 (1987) |
| 4+ | N/A | 24.4 (332) |
| P value | N/A | P = 0.5341 |
| **Parity*** | | |
| 1 | 31.4 (2101) | N/A |
| 2 | 33.8 (1851) | N/A |
| 3 | 33.6 (776) | N/A |
| 4+ | 31.6 (411) | N/A |
| P value | P=0.0691 | N/A |
| **Ethnicity** | | |
| British White | 29.96 (3869) | 23.3 (2761) |
| Other White | 61.77 (206) | 21.6 (52) |
| Mixed | 44.2 (80) | 26.5 (33) |
| Indian | 46.07 (215) | 12.0 (43) |
| Pakistani / Bangladeshi | 32.27 (383) | 19.2 (148) |
| Black or Black British | 62.38 (367) | 29.9 (104) |
| Other | 62.36 (229) | 22.8 (41) |
| P value | <0.001 | P = 0.0006 |

Parity was adjusted for in the childcare-breastfeeding analysis (Chapter 7) instead of number of children in the household. The association between childcare before the age of 4 months and parity is not shown in a table for brevity, but test for trend was statistically significant (P<0.001).

Association between potential confounding factors and the main exposures and outcomes for the home environment analysis (Chapter 5)

*Table 2A4: association between injuries in the home and the main potential confounding variables*

| | **% injured in home** |
|---|---|
| **Number of children** | |
| 1 | 21.01 (1,248) |
| 2-3 | 22.33 (1,645) |
| 4+ | 24.83 (258) |
| | P = 0.0304 |
| **Maternal age** | |
| 14-19 | 27.91 (721) |
| 20-24 | 24.2 (918) |
| 25-29 | 19.45 (812) |
| 30-34 | 19.88 (514) |
| 35-39 | 15.28 (115) |
| 40+ | 17.39 (8) |
| | P<0.001 |
| **Childcare** | |
| Parent only | 23.20 (1303) |
| Informal | 21.60 (956) |
| Formal | 20.65 (747) |
| | P = 0.0324 |
| **Ethnicity** | |
| White British | 23.00 (2,739) |
| White other | 18.15 (44) |
| Mixed | 27.24 (30) |
| Indian | 12.32 (44) |
| Bangladeshi or Pakistani | 18.98 (168) |
| Black British | 16.15 (67) |
| Other | 19.03 (52) |
| | P = 0.0012 |

*Table 2A5: association between number of children in the household and the SECs measures*

| | **No children in household** | | |
|---|---|---|---|
| | 1 | 2-3 | 4+ |
| **NS-SEC** | | | |
| Managerial | 37.44 (1,991) | 29.92 (1,945) | 19.54 (151) |
| Intermediate | 23.60 (1306) | 25.14 (1575) | 20.62 (152) |
| Routine | 38.96 (2,204) | 44.94 (3,118) | 59.84 (519) |
| | P<0.001 | | |
| **Education** | | | |
| Degree + | 20.94 (1233) | 16.09 (1158) | 7.91 (78) |
| Diploma | 10.08 (610) | 9.50 (660) | 4.44 (47) |
| A Levels | 10.30 (634) | 9.78 (716) | 5.24 (58) |
| GCSE A-C | 33.56 (1971) | 36.53 (2575) | 30.65 (309) |
| GCSE D-G | 11.91 (685) | 10.40 (735) | 10.05 (104) |
| No qualifications | 11.21 (719) | 15.58 (1267) | 38.42 (485) |
| | P<0.001 | | |
| **Lone parenthood** | | | |
| Couple families | 82.75 (4,882) | 88.37 (6,426) | 82.88 (927) |
| Lone parents | 17.25 (1,110) | 11.63 (887) | 17.12 (202) |
| | P<0.001 | | |
| **Tenure** | | | |
| Privately rent | 9.22 (525) | 6.89 (479) | 8.11 (91) |
| Socially rent | 19.19 (1160) | 24.79 (1858) | 44.20 (484) |
| Own/mortgage | 62.37 (3711) | 65.13 (4719) | 45.98 (527) |
| Other | 9.22 (584) | 3.19 (248) | 1.70 (19) |
| | P<0.001 | | |
| **IMD (quintile)^** | | | |
| Most deprived | 20.96 (1096) | 22.29 (1434) | 40.57 (393) |
| 2 | 19.94 (848) | 19.00 (983) | 19.62 (135) |
| 3 | 21.63 (706) | 20.08 (802) | 18.63 (100) |
| 4 | 19.52 (573) | 18.67 (670) | 10.42 (49) |
| Least deprived | 17.95 (505) | 19.96 (688) | 10.76 (49) |
| | P<0.001 | | |

*Table 2A6: association between ethnicity and the SECs measures*

| | **Ethnicity** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **White British** | **White Other** | **Mixed** | **Indian** | **Bangladeshi or Pakistani** | **Black British** | **Other** |
| **NS-SEC** | | | | | | | |
| Managerial | 32.64 (3675) | 50.81 (109) | 22.46 (21) | 32.41 (78) | 16.66 (53) | 29.15 (87) | 32.79 (55) |
| Intermediate | 24.34 (2666) | 20.50 (51) | 23.77 (20) | 29.29 (83) | 18.09 (88) | 24.91 (75) | 28.34 (49) |
| Routine | 43.02(5071) | 28.69 (75) | 53.77 (60) | 38.30 (135) | 65.25 (280) | 45.94 (145) | 38.87 (62) |
| | P<0.001 | | | | | | |
| **Education** | | | | | | | |
| Degree + | 17.22 (2,077) | 41.3 (105) | 16.71 (18) | 26.00 (87) | 6.29 (51) | 19.15 (68) | 23.21 (60) |
| Diploma | 9.74 (1,166) | 6.28 (20) | 6.01 (8) | 8.74 (26) | 3.16 (24) | 11.29 (43) | 9.71 (26) |
| A Levels | 9.95 (1,230) | 13.38 (30) | 5.33 (7) | 9 .00 (33) | 6.87 (63) | 6.29 (27) | 7.36 (17) |
| GCSE A-C | 37.44 (4,422) | 6.86 (18) | 28.18 (33) | 19.75 (77) | 19.98 (171) | 20.87 (91) | 14.00(35) |
| GCSE D-G | 11.66 (1,349) | 1.47 (3) | 9.71 (14) | 7.14 (32) | 7.17 (74) | 9.1 (38) | 3.65 (8) |
| No | 13.28 (1,716) | 12.15 (35) | 29.46 (42) | 18.08 (75) | 44.52 (410) | 26.56 (123) | 26.9 (69) |
| | P<0.001 | | | | | | |
| **Lone parenthood** | | | | | | | |
| Couple | 85.85 | 93.94 (241) | 65.50 (79) | 95.53 (347) | 93.48 (833) | 57.05 (231) | 88.65 (227) |
| Lone parents | 14.15 (1838) | 6.06 (19) | 34.50 (47) | 4.47 (18) | 6.52 (64) | 42.95 (186) | 11.35 (25) |
| | P<0.001 | | | | | | |
| **Tenure** | | | | | | | |
| Privately rent | 7.76 (883) | 13.14 (31) | 12.11 (16) | 8.41 (31) | 7.72 (76) | 4.67 (18) | 14.57 (37) |
| Socially rent | 22.82 (2,794) | 14.77 (51) | 45.44 (59) | 8.87 (36) | 22.47 (207) | 66.23 (294) | 27.91 (58) |
| Own/mortgage | 64.64 (7,816) | 67.22 (166) | 35.05 (39) | 67.44 (248) | 49.89 (441) | 26.22 (90) | 51.15 (143) |
| Other | 4.78 (581) | 4.88 (12) | 7.39 (11) | 15.28 (49) | 19.93 (168) | 2.88 (14) | 6.38 (13) |
| | P<0.001 | | | | | | |
| **IMD (quintile)^** | | | | | | | |
| Least deprived | 20.39 (1,155) | 22.66 (36) | 14.02 (11) | 13.70 (20) | 3.82 (11) | 0.97 (2) | 5.94 (7) |
| 4 | 19.75 (1,154) | 22.87 (38) | 6.49 (5) | 16.88 (34) | 3.99 (13) | 7.28 (17) | 18.32 (26) |
| 3 | 21.85 (1,375) | 21.02 (42) | 11.61 (11) | 18.12 (53) | 8.28 (41) | 12.87 (41) | 17.28 (39) |
| 2 | 19.19 (1,510) | 21.41 (56) | 24.94 (22) | 27.47 (120) | 11.73 (94) | 26.59 (93) | 23.60 (64) |
| Most deprived | 18.81 (1,632) | 12.03 (42) | 42.93 (64) | 23.83 (126) | 72.18 (711) | 52.30 (251) | 34.86 (90) |
| | P<0.001 | | | | | | |

*Table 2A7: association between age at first live birth in the household and the SECs measures*

| | Age at first live birth (years) | | | | | |
|---|---|---|---|---|---|---|
| | **14-19 years** | **20-24 years** | **25-29 years** | **30-34 years** | **35-39 years** | **40+ years** |
| **NS-SEC** | | | | | | |
| Managerial | 6.81 (134) | 13.68 (474) | 38.41 (1,484) | 57.68 (1,495) | 62.62 (433) | 53.2 (32) |
| Intermediate | 13.18 (265) | 23.56 (791) | 29.94 (1,129) | 25.58 (641) | 22.33 (146) | 33.89 (20) |
| Routine | 80.01 | 62.76 (2,154) | 31.64 (1,265) | 16.74 (486) | 15.05 (119) | 12.91 (9) |
| | P<0.001 | | | | | |
| **Education** | | | | | | |
| Degree + | 0.98 (25) | 4.93 (211) | 22.81 (934) | 36.07 (969) | 38.98 (282) | 33.67 (21) |
| Diploma | 1.69 (52) | 8.47 (310) | 13.25 (533) | 12.20 (329) | 10.63 (72) | 15.54 (10) |
| A Levels | 4.82 (135) | 9.58 (387) | 11.24 (460) | 11.54 (305) | 12.08 (90) | 12.23 (8) |
| GCSE A-C | 38.43 | 40.09 (1,460) | 34.77 (1,359) | 29.44 (760) | 28.35 (192) | 30.50 (19) |
| GCSE D-G | 18.96 (474) | 14.16 (522) | 9.35 (350) | 4.84 (119) | 3.46 (28) | 0.00 (0) |
| No qualifications | 33.78 (927) | 20.35 (834) | 6.48 (309) | 4.30 (143) | 4.85 (42) | 3.90 (4) |
| | P<0.001 | | | | | |
| **Lone parenthood** | | | | | | |
| Couple families | 63.23 | 82.15 (3,113) | 93.83 (3,789) | 96.22 (2,565) | 94.45 (680) | 96.09 (58) |
| Lone parents | 36.77 (988) | 17.85 (719) | 6.17 (260) | 3.78 (112) | 5.55 (40) | 3.91 (5) |
| | P<0.001 | | | | | |
| **Tenure** | | | | | | |
| Privately rent | 13.17 (342) | 9.9 (352) | 5.51 (208) | 5.14 (116) | 4.35 (34) | 3.62 (2) |
| Socially rent | 56.97 | 34.08 (1,270) | 9.82 (422) | 4.47 (139) | 5.89 (48) | 12.99 (8) |
| Own/mortgage | 18.54 (556) | 48.54 (1,911) | 81.53 (3,287) | 88.44 (2,356) | 87.77 (625) | 80.93 (51) |
| Other | 11.32 (299) | 7.48 (293) | 3.14 (131) | 1.95 (63) | 1.99 (13) | 2.46 (2) |
| | P<0.001 | | | | | |
| **IMD (quintile)^** | | | | | | |
| Least deprived | 4.91 (50) | 11.81 (183) | 22.91 (450) | 30.88 (435) | 29.92 (116) | 16.64 (4) |
| 4 | 9.08 (98) | 12.09 (204) | 22.91 (472) | 27.76 (405) | 25.18 (99) | 26.93 (7) |
| 3 | 16.81 (198) | 20.07 (371) | 24.11 (565) | 20.37 (348) | 21.62 (100) | 13.75 (4) |
| 2 | 24.62 (365) | 24.24 (575) | 17.72 (563) | 12. 78 (289) | 15.08 (99) | 20.56 (9) |
| Most deprived | 44.58 (860) | 31.79 (1,046) | 12.35 (478) | 8.20 (219) | 8.20 (66) | 22.13 (10) |
| | P<0.001 | | | | | |

**Appendix 3:** There is no supplementary information for Chapter 3 “Unintentional injury: policy context, trends and inequalities, and potential policy influences”

# **Appendix 4:** Supplementary information for Chapter 4 "Childcare: policy context, trends and inequalities, and links with child health"

In this appendix the use of some retrospective childcare data collected at the third sweep (age 5 years) referring to the period 9 months to 3 years is explored, since it was discovered after the creation of the original childcare variable reported throughout this thesis. The strengths and limitations of this new information are discussed and the impact that it has on the original childcare variable and some of the associations observed between childcare and health is considered.

## Exploring the retrospective childcare information collected at the third sweep (age 5 years)

In a book published by CLS in 2010, summarising findings from the first three sweeps of the MCS [1], it was highlighted that the childcare data collected at the second sweep might be inaccurate.

At MCS2, the childcare section of the interview opened with:
*I'd now like to ask you about any regular child care arrangements you have used. By childcare arrangement I mean for times when you may have been at work, or someone else was looking after ^ Jack for any other reason. By regular I mean an arrangement that normally runs for at least five hours a week and lasted for at least one month. Please include childcare provided by ^ Jack's other relatives (or mother/father).*

It was subsequently thought that the wording used may have lead to mothers not reporting nursery school/early education arrangements (if their main purpose was not to provide childcare). This is a common problem that was highlighted in a report comparing British sources of childcare data in 2004[2].

Therefore at MCS3 a retrospective question was asked regarding formal childcare arrangements:

*Has [^Cohort child's name] ever been to any of the early education or childcare providers on this card?*
PROBE: What others?
CODE ALL THAT APPLY
1 Nursery School/Nursery Class
2 Playgroups
3 Pre-school
4 Childminder
5 Day Nursery (including workplace/college crèche)
6 None of these

Mothers who reported using nursery (option 1) were then asked to give the date when it first started.

1592 children who had childcare data at the second sweep did not take part at the third sweep and therefore will not have this additional information.

**Assessing the impact on the original childcare variables used throughout the thesis**

Using the date that nursery school commenced, and the second sweep interview date, it was possible to identify children who had started childcare before the date of the second interview. 1147 of these children had been classified as being cared for only by a parent in the second sweep childcare variable I created for the project. And a further 943 reported as using nursery were classified as being looked after in informal childcare (in my second sweep childcare variable).

However because the question was retrospective it is possible that some of these responses are inaccurate. For example 50% of the children were reported as having started nursery school 6 months or less before their second sweep interview date, and 75% were reported as having started 11 months before the interview date (the period between the first and second sweep interviews was on average 27 months). Since this was being reported at age 5, potentially the period of recall was over a period of 4 years.

**Number of months between second sweep interview date and date that nursery school commenced, for children classified as parent only in original second sweep childcare variable**

| | Freq. | Percent | Cum. | |
|---|---|---|---|---|
| -38 | 1 | 0.09 | 0.09 | |
| -36 | 1 | 0.09 | 0.17 | |
| -35 | 3 | 0.26 | 0.44 | |
| -34 | 1 | 0.09 | 0.52 | |
| -33 | 2 | 0.17 | 0.70 | |
| -32 | 2 | 0.17 | 0.87 | |
| -31 | 2 | 0.17 | 1.05 | |
| -30 | 2 | 0.17 | 1.22 | |
| -29 | 4 | 0.35 | 1.57 | |
| -28 | 3 | 0.26 | 1.83 | |
| **-27** | **4** | **0.35** | **2.18** | ← Approx time of MCS1 interview |
| -26 | 3 | 0.26 | 2.44 | |
| -25 | 3 | 0.26 | 2.70 | |
| -24 | 10 | 0.87 | 3.57 | |
| -23 | 3 | 0.26 | 3.84 | |
| -22 | 4 | 0.35 | 4.18 | |
| -21 | 5 | 0.44 | 4.62 | |
| -20 | 8 | 0.70 | 5.32 | |
| -19 | 10 | 0.87 | 6.19 | |
| -18 | 14 | 1.22 | 7.41 | |
| -17 | 13 | 1.13 | 8.54 | |
| -16 | 11 | 0.96 | 9.50 | |
| -15 | 18 | 1.57 | 11.07 | |
| -14 | 25 | 2.18 | 13.25 | |
| -13 | 39 | 3.40 | 16.65 | |
| -12 | 51 | 4.45 | 21.10 | |
| -11 | 50 | 4.36 | 25.46 | |
| -10 | 54 | 4.71 | 30.17 | |
| -9 | 45 | 3.92 | 34.09 | |
| -8 | 53 | 4.62 | 38.71 | |
| -7 | 59 | 5.14 | 43.85 | |
| -6 | 78 | 6.80 | 50.65 | |
| -5 | 67 | 5.84 | 56.50 | |
| -4 | 86 | 7.50 | 63.99 | |
| -3 | 86 | 7.50 | 71.49 | |
| -2 | 124 | 10.81 | 82.30 | |
| -1 | 203 | 17.70 | 100.00 | ← Time of MCS2 interview |
| Total | 1,147 | 100.00 | | |

**Number of months between the second sweep interview date and date that nursery school commenced, for children classified as informal childcare in original second sweep childcare variable**

| | Freq. | Percent | Cum. | |
|---|---|---|---|---|
| -41 | 1 | 0.11 | 0.11 | |
| -39 | 2 | 0.21 | 0.32 | |
| -36 | 2 | 0.21 | 0.53 | |
| -35 | 1 | 0.11 | 0.64 | |
| -34 | 1 | 0.11 | 0.74 | |
| -33 | 4 | 0.42 | 1.17 | |
| -32 | 8 | 0.85 | 2.01 | |
| -31 | 4 | 0.42 | 2.44 | |
| -30 | 8 | 0.85 | 3.29 | |
| -29 | 2 | 0.21 | 3.50 | |
| -28 | 4 | 0.42 | 3.92 | |
| **-27** | **5** | **0.53** | **4.45** | ← Approx time of first interview |
| -26 | 4 | 0.42 | 4.88 | |
| -25 | 8 | 0.85 | 5.73 | |
| -24 | 14 | 1.48 | 7.21 | |
| -23 | 7 | 0.74 | 7.95 | |
| -22 | 7 | 0.74 | 8.70 | |
| -21 | 9 | 0.95 | 9.65 | |
| -20 | 9 | 0.95 | 10.60 | |
| -19 | 18 | 1.91 | 12.51 | |
| -18 | 17 | 1.80 | 14.32 | |
| -17 | 11 | 1.17 | 15.48 | |
| -16 | 20 | 2.12 | 17.60 | |
| -15 | 17 | 1.80 | 19.41 | |
| -14 | 20 | 2.12 | 21.53 | |
| -13 | 40 | 4.24 | 25.77 | |
| -12 | 49 | 5.20 | 30.97 | |
| -11 | 47 | 4.98 | 35.95 | |
| -10 | 47 | 4.98 | 40.93 | |
| -9 | 32 | 3.39 | 44.33 | |
| -8 | 38 | 4.03 | 48.36 | |
| -7 | 44 | 4.67 | 53.02 | |
| -6 | 54 | 5.73 | 58.75 | |
| -5 | 52 | 5.51 | 64.26 | |
| -4 | 58 | 6.15 | 70.41 | |
| -3 | 66 | 7.00 | 77.41 | |
| -2 | 71 | 7.53 | 84.94 | |
| -1 | 142 | 15.06 | 100.00 | ← Time of second interview |

I created 2 new second sweep childcare variables to explore the potential impact that this new information would have on childcare uptake; the first including all nursery school attendance which commenced before the second sweep interview date (so assuming perfect recall) and the second including only those which commenced 3 months before the second sweep interview date (so allowing a period of 3 months for recall error).

Children who were classified as being in informal childcare in second sweep variable were left as they were, because it is possible that the informal childcare was used for a longer duration than formal childcare, or that formal childcare was a subsidiary childcare arrangement (unfortunately it is not possible to tell).

*Table 4A1: Comparison of the original and new childcare variables*

| | **Original variable** | **New with 'repaired' variable** | **New with 3 month recall error** |
|---|---|---|---|
| Parent only | 40.6 (5681) | 32.6 (4534) | 35.2 (4947) |
| Informal | 31.1 (4449) | 31.1 (4449) | 31.1 (4449) |
| Formal | 28.3 (3621) | 36.3 (4768) | 33.7 (4355) |

1529 (11%) children with childcare information at the second sweep did not take part in the third sweep.

So there is an increase in formal childcare, and obviously the baseline (parent only) has changed.

I have rerun some of the analyses (which used second sweep childcare data, reported in Chapters 6 and 8) to see if the associations are altered. Table 4A2 contains the risk of being overweight, for the original childcare variable and then also the new childcare variables using the retrospective data. At the third sweep mothers were not asked to report hours per week but whether childcare was part-time or full-time (part-time was any amount up to mornings or afternoons 5 days a week, or full days for up to 3 days). Therefore it was not possible to use the 10 hour cut-off used in the main analyses and so associations with any amount of childcare are compared. I also calculated risk of being overweight, stratified by part- and full-time (although these are not directly comparable, because our definition of p/t f/t was 10-30 hours a week and 31+). The associations are largely unchanged.

*Table 4A2: Risk ratios (and 95% CIs) for being overweight according to the original and new childcare variables, overall, according to time spent in childcare, and stratified by SECs*

| **Risk of being overweight** | **Original variable** | **New with perfect recall** | **New with 3 month recall error** |
|---|---|---|---|
| *Overall* | | | |
| Parent only | | | |
| Informal | 1.08 (0.99, 1.18) | 1.09 (1.00, 1.20) | 1.08 (0.99, 1.18) |
| Formal | 0.99 (0.90, 1.09) | 1.01 (0.92, 1.11) | 0.99 (0.91, 1.09) |
| *Time in childcare* | | | |
| Informal p/t | 1.10 (0.99, 1.22) | 1.10 (0.99, 1.23) | 1.09 (0.99, 1.21) |
| Informal f/t | 1.36 (1.17, 1.59)* | 1.37 (1.18, 1.60)* | 1.36 (1.16, 1.59)* |
| Formal p/t | 1.02 (0.92, 1.12) | 1.03 (0.93, 1.13) | 1.01 (0.91, 1.13) |
| Formal f/t | 1.15 (0.99, 1.33) | 1.17 (1.01, 1.36) | 1.15 (0.98, 1.35) |
| *Stratified by SECs* | | | |
| *NS-SEC* | | | |
| Routine and manual | | | |
| Informal | 1.12 (1.00, 1.26)* | 1.12 (0.99, 1.27) | 1.10 (0.98, 1.24) |
| Formal | 1.09 (0.94, 1.27) | 1.06 (0.92, 1.22) | 1.01 (0.88, 1.17) |
| Managerial and prof | | | |
| Informal | 1.11 (0.93, 1.32) | 1.10 (0.90, 1.34) | 1.10 (0.92, 1.33) |
| Formal | 0.92 (0.78, 1.09) | 0.92 (0.76, 1.11) | 0.93 (0.77, 1.11) |
| *Education* | | | |
| No qualifications | | | |
| Informal | 1.15 (0.91, 1.44) | 1.17 (0.93, 1.48) | 1.14 (0.90, 1.43) |
| Formal | 1.06 (0.80, 1.41) | 1.09 (0.88, 1.35) | 1.01 (0.79, 1.29) |
| Degree | | | |
| Informal | 1.31 (1.02, 1.69)* | 1.31 (1.00, 1.71)* | 1.35 (1.04, 1.74)* |
| Formal | 1.01 (0.79, 1.28) | 1.01 (0.79, 1.28) | 1.04 (0.82, 1.33) |

Table 4A3 overleaf shows the association between childcare and the risk of being injured between 9 months and 3 years, for the original variable (as in Chapter 6) and the two new variables. Again, the associations were similar.

*Table 4A3: Risk ratios (and 95% CIs) for being injured according to the original and new childcare variables, overall and stratified by SECs*

| Risk of being injured | Original variable | New with perfect recall | New with 3 month recall error |
|---|---|---|---|
| *Overall* | | | |
| Parent only | - | - | - |
| Informal | 1.07 (1.00, 1.15) | 1.07 (0.99, 1.15) | 1.06 (0.99, 1.14) |
| Formal | 1.00 (0.93, 1.08) | 0.99 (0.92, 1.06) | 0.98 (0.91, 1.05) |
| Stratified by SECs | | | |
| *NS-SEC* | | | |
| Routine and manual | | | |
| Informal | 1.12 (1.02, 1.22)* | 1.09 (1.00, 1.20) | 1.10 (1.01, 1.21)* |
| Formal | 1.09 (0.98, 1.23) | 1.00 (0.91, 1.11) | 1.03 (0.93, 1.14) |
| Managerial and prof | | | |
| Informal | 1.02 (0.87, 1.19) | 1.00 (0.84, 1.18) | 0.96 (0.82, 1.12) |
| Formal | 1.00 (0.88, 1.13) | 0.97 (0.85, 1.11) | 0.92 (0.80, 1.04) |
| *IMD (quintiles)*^ | | | |
| Most deprived | | | |
| Informal | 1.23 (1.08, 1.41)* | 1.23 (1.07, 1.42)* | 1.23 (1.08, 1.41)* |
| Formal | 1.08 (0.92, 1.26) | 1.05 (0.91, 1.20) | 1.05 (0.91, 1.22) |
| Least deprived | | | |
| Informal | 0.88 (0.71, 1.11) | 0.84 (0.67, 1.07) | 0.83 (0.66, 1.05) |
| Formal | 1.02 (0.85, 1.23) | 0.95 (0.78, 1.15) | 0.92 (0.76, 1.12) |

**Assessing the impact on the original childcare variable**

As can be seen from the above tables, the majority of nursery school cases started after the approximate time of the MCS1 interview (based on average of 27 months). This was checked using the actual interview date for MCS1 and only 20 children were recorded as being looked after in nursery school but were classified as parent only in the original MCS1 variable. Two were classified as being looked after in informal childcare. These numbers are very small and are likely to be errors since nursery school is not attended by infants.

**Conclusion**

Whilst the retrospective question at the third sweep may have picked up on some undetected childcare used between 9 months and 3 years, this information will be subject to recall bias and is likely to overestimate formal childcare use. Therefore no changes have been made to the original childcare variables. Whilst the analyses presented in Tables 4A2 and 4A3 indicate that the patterns observed in Chapters 6 and 8 would remain the same if the new childcare information was taken into account, it is possible that the prevalence of formal childcare use has been underestimated in this thesis.

**References**

[1]. Children of the 21st century: the first five years. Hansen, Joshi and Dex. 2010. Policy Press.

[2] Brewer M, Shaw J. Childcare use and mothers' employment: a review of British data sources. Families and Children Strategic Analysis Programme; 2004. Report No.: Working Paper No 16.

# **Appendix 5:** Supplementary information for Chapter 5 "Home environment and inequalities in injury"

This appendix contains supplementary analyses for Chapter 5, including five sensitivity analyses (Tables 5A2-5A5) which are discussed in Chapter 5, section 5.4.5.

*Table 5A1a: Distribution of the housing quality score, and how it was collapsed*

| **Detailed housing quality score*** | **Freq.** | **%*** | **Collapsed score** | **Freq** |
|---|---|---|---|---|
| 0 | 2,308 | 16.07 | 0 | 2308 |
| 1 | 6,911 | 48.11 | 1 | 6911 |
| 2 | 1,292 | 8.99 | 2-3 | 3023 |
| 3 | 1,731 | 12.05 | | |
| 4 | 645 | 4.49 | 4-5 | 1318 |
| 5 | 673 | 4.69 | | |
| 6 | 378 | 2.63 | 6+ | 804 |
| 7 | 221 | 1.54 | | |
| 8 | 137 | 0.95 | | |
| 9 | 49 | 0.34 | | |
| 10 | 17 | 0.12 | | |
| 11 | 2 | 0.01 | | |
| *Total* | *14,364* | *100* | | *14,364* |

*unweighted

*Table 5A1b: Distribution of safety equipment score*

| **Safety equipment score** | **Freq.** | **%*** |
|---|---|---|
| 0 (all 4 types of equipment) | 2,189 | 15.19 |
| 1 (3) | 3,876 | 26.90 |
| 2 (2) | 3,910 | 27.13 |
| 3 (1) | 3,352 | 23.26 |
| 4 (none of the reported equipment) | 1,083 | 7.52 |

*unweighted

## Sensitivity analyses

Relevance of safety equipment to certain households and injuries

*Table 5A2: Risk ratios (and 95% CIs) for being injured according to safety equipment use, for specific households and specific injury types*

| Equipment type | % injured (N) | RR all households | % injured (N) for | RR for relevant |
|---|---|---|---|---|
| **Fireguard** | | | | |
| *All injuries* | | | | |
| Fireguard | 22.1 (2120) | - | 21.1 (520) | - |
| No fireguard | 21.9 (1030) | 0.99 (0.92, 1.07) | 22.8 (486) | 1.07 (0.95, 1.21) |
| *Burns/scalds* | | | | |
| Fireguard | 2.1 (199) | - | 1.8 (45) | - |
| No Fireguard | 1.9 (96) | 1.12 (0.85, 1.48) | 1.9 (44) | 1.05 (0.67, 1.65) |
| **Safety gate** | | | | |
| *All injuries* | | | | |
| Safety gate | 22.4 (1743) | - | | |
| No safety gate | 21.5 (1407) | 0.96 (0.89, 1.03) | | |
| *Falls* | | | | |
| Safety gate | 12.5 (989) | - | | |
| No safety gate | 11.8 (783) | 0.95 (0.85, 1.05) | | |

** households with working fires were considered to be relevant for the fire guard analyses. Working fires were defined as fires used for heating: gas, wood, coal and electric
Safety gates were treated as relevant for all households because it was not possible to identify homes with internal staircases and because the gates can also be used to contain children or keep them out of dangerous rooms such as the kitchen. Injuries from falls were defined as head injuries leading to concussion, minor head injuries, broken and fractured bones

*Table 5A3: Risk ratios (and 95% CIs) for being injured, according to socio-economic circumstances, excluding children whose most severe (or only) injury occurred outside the home (classified as having not been injured in the main analysis) (Columns A to C), and limited to household which did not move (Columns D to F)*

| | **Excluding children who were injured outside the home** | | | **In non-movers only** | | |
|---|---|---|---|---|---|---|
| | %(N) injured | Unadj RR | Adj RR[1] | %(N) injured | Unadj RR | Adj RR[1] |
| | Col A | Col B | Col C | Col D | Col E | Col F |
| *NS-SEC* | | | | | | |
| Managerial | 19.7 (783) | - | - | 18.2 (538) | - | - |
| Intermediate | 20.6 (597) | 1.05 (0.94, 1.17) | 1.04 (0.93, 1.16) | 20.0 (429) | 1.10 (0.96, 1.26) | 1.09 (0.96, 1.25) |
| Routine | 26.3 (1,479) | 1.34 (1.21, 1.47)* | 1.31 (1.19, 1.45)* | 25.0 (992) | 1.38 (1.23, 1.54)* | 1.36 (1.22, 1.52)* |
| *Education* | | | | | | |
| Degree | 17.4 (429) | - | - | 16.2 (290) | - | - |
| Diploma | 21.8 (275) | 1.25 (1.08, 1.45)* | 1.24 (1.07, 1.43)* | 20.6 (182) | 1.27 (1.04, 1.55)* | 1.27 (1.04, 1.55)* |
| A/AS Level | 20.4 (275) | 1.17 (1.02, 1.35)* | 1.15 (1.00, 1.33)* | 18.1 (184) | 1.12 (0.93, 1.35) | 1.12 (0.93, 1.34) |
| GCSE A-C | 24.6 (1,163) | 1.41 (1.25, 1.58)* | 1.39 (1.23, 1.56)* | 23.6 (812) | 1.46 (1.27, 1.68)* | 1.44 (1.26, 1.66)* |
| GCSE D-G | 25.1 (362) | 1.44 (1.26, 1.64)* | 1.41 (1.24, 1.61)* | 21.8 (219) | 1.35 (1.14, 1.60)* | 1.33 (1.12, 1.58)* |
| No qualifications | 24.8 (569) | 1.42 (1.24, 1.62)* | 1.41 (1.23, 1.61)* | 24.4 (329) | 1.51 (1.27, 1.79)* | 1.49 (1.25, 1.77)* |
| *Lone parenthood* | | | | | | |
| Couple families | 21.9 (2592) | - | - | 20.7 (1813) | - | - |
| Lone parents | 27.3 (559) | 1.25 (1.13, 1.38)* | 1.23 (1.11, 1.36)* | 25.2 (321) | 1.22 (1.08, 1.38)* | 1.20 (1.06, 1.36)* |
| *IMD (quintiles)^* | | | | | | |
| Least deprived | 20.2 (243) | - | - | 19.9 (182) | - | - |
| 4 | 20.6 (261) | 1.02 (0.87, 1.20) | 1.01 (0.86, 1.19) | 18.9 (174) | 0.95 (0.79, 1.15) | 0.95 (0.78, 1.14) |
| 3 | 23.1 (349) | 1.15 (0.99, 1.33) | 1.14 (0.98, 1.33) | 22.0 (230) | 1.10 (0.92, 1.32) | 1.10 (0.92, 1.32) |
| 2 | 23.7 (432) | 1.17 (1.02, 1.36)* | 1.15 (0.99, 1.34) | 21.9 (272) | 1.10 (0.92, 1.31) | 1.08 (0.91, 1.30) |
| Most deprived | 24.6 (649) | 1.22 (1.07, 1.40)* | 1.21 (1.05, 1.40)* | 22.8 (414) | 1.15 (0.98, 1.35) | 1.15 (0.96, 1.37) |
| *Tenure* | | | | | | |
| Own/mortgage | 20.5 (1,789) | - | - | 19.8 (1,344) | - | - |
| Socially rent | 27.9 (915) | 1.36 (1.26, 1.48)* | 1.36 (1.26, 1.48)* | 26.0 (597) | 1.31 (1.19, 1.45)* | 1.31 (1.19, 1.45)* |
| Privately rent | 23.6 (254) | 1.15 (1.00, 1.32)* | 1.13 (0.98, 1.29) | 20.2 (103) | 1.02 (0.84, 1.24) | 1.01 (0.83, 1.24) |

| | | | | | | |
|---|---|---|---|---|---|---|
| Other | 24.4 (192) | 1.19 (1.03, 1.38)* | 1.20 (1.04, 1.38)* | 21.6 (89) | 1.09 (0.88, 1.36) | 1.11 (0.89, 1.38) |

[1] adjusting for housing and safety equipment scores.

Exploring individual components of housing quality and safety equipment rather than scores

*Table 5A4- ratios (and 95% CIs) for being injured, according to socio-economic circumstances, controlling for individual components of housing quality and safety equipment (rather than scores)*

| | %(N) | Unadj RR | Adj RR[1] | Adj RR[2] | Adj RR[3] |
|---|---|---|---|---|---|
| *NS-SEC* | | | | | |
| Managerial | 19.0 (783) | - | | | |
| Intermediate | 20.0 (597) | 1.05 (0.94, 1.17) | 1.04 (0.93, 1.16) | 1.04 (0.93, 1.16) | 1.02 (0.91, 1.13) |
| Routine | 25.4 (1479) | 1.33 (1.21, 1.47)* | 1.30 (1.18, 1.44)* | 1.31 (1.18, 1.44)* | 1.13 (1.01, 1.27)* |
| *Education* | | | | | |
| Degree | 16.9 (429) | - | | | |
| Diploma | 21.0 (275) | 1.24 (1.07, 1.43)* | 1.22 (1.05, 1.41)* | 1.22 (1.05, 1.41)* | 1.18 (1.01, 1.38)* |
| A/AS Level | 19.9 (275) | 1.17 (1.02, 1.35)* | 1.16 (1.00, 1.34)* | 1.16 (1.01, 1.34)* | 1.08 (0.92, 1.25) |
| GCSE A-C | 23.8 (1163) | 1.40 (1.25, 1.58)* | 1.38 (1.22, 1.55)* | 1.38 (1.23, 1.56)* | 1.25 (1.09, 1.42)* |
| GCSE D-G | 24.1 (362) | 1.42 (1.24, 1.62)* | 1.39 (1.22, 1.59)* | 1.40 (1.22, 1.60)* | 1.18 (1.01, 1.38)* |
| No qualifications | 24.1 (569) | 1.42 (1.24, 1.63)* | 1.37 (1.19, 1.57)* | 1.40 (1.21, 1.60)* | 1.19 (1.01, 1.39)* |
| *Lone parenthood* | | | | | |
| Couple families | 21.2 (2592) | - | - | - | - |
| Lone parents | 26.2 (559) | 1.23 (1.12, 1.36)* | 1.20 (1.09, 1.34)* | 1.22 (1.10, 1.35)* | 1.09 (0.98, 1.22) |
| *IMD (quintiles)^* | | | | | |
| Least deprived | 19.7 (243) | - | - | - | - |
| 4 | 20.0 (261) | 1.02 (0.87, 1.19) | 1.01 (0.86, 1.18) | 1.01 (0.86, 1.19) | 1.02 (0.87, 1.20) |
| 3 | 22.5 (349) | 1.14 (0.98, 1.32) | 1.12 (0.96, 1.30) | 1.13 (0.97, 1.32) | 1.07 (0.92, 1.26) |
| 2 | 22.9 (432) | 1.16 (1.01, 1.34)* | 1.12 (0.97, 1.30) | 1.13 (0.98, 1.31) | 1.05 (0.90, 1.23) |
| Most deprived | 23.7 (649) | 1.20 (1.05, 1.37)* | 1.15 (0.99, 1.32) | 1.17 (1.01, 1.36)* | 1.07 (0.91, 1.26) |
| *Tenure* | | | | | |
| Own/mortgage | 19.9 (1789) | - | - | - | - |

| | | | | | |
|---|---|---|---|---|---|
| Socially rent | 26.8 (915) | 1.35 (1.24, 1.46)* | 1.33 (1.23, 1.45)* | 1.34 (1.24, 1.46)* | 1.12 (1.02, 1.24)* |
| Privately rent | 22.8 (254) | 1.15 (1.00, 1.31)* | 1.11 (0.96, 1.27) | 1.12 (0.97, 1.28) | 1.01 (0.87, 1.16) |
| Other | 23.3(192) | 1.17 (1.01, 1.35)* | 1.14 (0.98, 1.32) | 1.16 (1.00, 1.35)* | 1.10 (0.93, 1.30) |

1] adjusting for housing quality measures (rooms per capita, build type, storey, garden, central heating, damp, central heating). [2] adjusting for [1] and safety equipment use (fireguard, safety gate, electric socket covers, smoke alarm). [3] adjusting for [2] and maternal age, ethnicity, number of children in household, main childcare type. ^England only

Correlation between the housing and safety equipment scores

*Table 5A5: Correlation between the housing quality score and the safety equipment score.*

| | | **Housing score: number of adverse features (%)** | | | | | |
|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2-3 | 4-5 | 6+ | Total |
| **Safety equipment score: 0 is all four, 4 is none** | 0 | 19.2 | 17.9 | 14.3 | 9.6 | 5.3 | 15.2% |
| | 1 | 30.6 | 31.3 | 26.1 | 20.1 | 13.8 | 28.1% |
| | 2 | 25.2 | 26.4 | 27.0 | 28.9 | 26.9 | 26.6% |
| | 3 | 21.2 | 19.7 | 23.4 | 29.1 | 35.5 | 22.4% |
| | 4 | 3.8 | 4.8 | 9.1 | 12.4 | 18.5 | 7.0% |
| Total | | 100% | 100% | 100% | 100% | 100% | 100% |

*Chi Square P < 0.0001*

*Test for a linear association (using linear regression) also produced p<0.001 although the R-squared was 0.04 indicating that only a small proportion of the variation in housing score was explained by the safety equipment score.*

# **Appendix 6:** Supplementary information for Chapter 6 "Childcare use and inequalities in unintentional injury"

The following tables contain the data from the two sensitivity analyses discussed in Chapter 6, section 6.4.3.

Excluding children who were looked after in more than one type of childcare

*Table 6A1: Risk ratio for being injured overall and by socio-economic circumstances, excluding children who were looked after in more than one type of childcare*

| | | *Age 9 months* | | | *Age 3 years* | |
|---|---|---|---|---|---|---|
| **Childcare** | **% (N) injured** | **Unadjusted RR** | **Adjusted RR**** | **% (N) injured** | **Unadjusted RR** | **Adjusted RR**** |
| **Overall association** | | | | | | |
| Parent only | 8.1 (549) | | | | | |
| Informal | 8.2 (202) | 1.02 (0.86, 1.22) | 0.94 (0.79, 1.12) | | 1.11 (1.02, 1.20)* | 1.08 (0.99, 1.17) |
| Formal | 6.8 (88) | 0.85 (0.66, 1.09) | 0.86 (0.66, 1.13) | | 1.02 (0.93, 1.11) | 1.04 (0.95, 1.13) |
| **Stratified associations** | | | | | | |
| **NS-SEC** | | | | | | |
| *Managerial & Professional* | | | | | | |
| Parent only | 8.4 (108) | | | 33.2 (287) | | |
| Informal | 7.2 (39) | 0.84 (0.57, 1.23) | 0.77 (0.54, 1.11) | 35.2 (237) | 1.06 (0.89, 1.27) | 1.02 (0.86, 1.21) |
| Formal | 5.1 (46) | 0.61 (0.41, 0.91) | 0.57 (0.38, 0.86)* | 34.0 (360) | 1.03 (0.89, 1.18) | 1.01 (0.88, 1.16) |
| *Intermediate* | | | | | | |
| Parent only | 8.9 (111) | | | 34.6 (320) | | |
| Informal | 6.7 (41) | 0.74 (0.46, 1.17) | 0.69 (0.44, 1.09) | 37.8 (241) | 1.09 (0.94, 1.27) | 1.07 (0.92, 1.25) |
| Formal | (24) | 0.98 (0.61, 1.57) | 0.90 (0.56, 1.45) | 36.3 (178) | 1.05 (0.86, 1.28) | 1.05 (0.86, 1.28) |
| *Routine & Manual* | | | | | | |
| Parent only | 8.9 (288) | | | 37.1 (1073) | | |
| Informal | 9.7 (104) | 1.20 (0.91, 1.57) | 1.09 (0.82, 1.44) | 41.7 (491) | 1.12 (1.02, 1.24)* | 1.11 (1.00, 1.23)* |
| Formal | 15.2 (15) | 1.82 (1.09, 3.05)* | 2.01 (1.19, 3.41)* | 39.6 (248) | 1.07 (0.93, 1.22) | 1.08 (0.95, 1.24) |
| **Education** | | | | | | |
| *Degree* | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Parent only | 9.5 (81) | - | | 29.8 (151) | | |
| Informal | 10.8 (30) | 1.13 (0.72, 1.77) | 1.14 (0.73, 1.76) | 34.5 (104) | 1.16 (0.92, 1.46) | 1.12 (0.89, 1.41) |
| Formal | 5.6 (44) | 0.59 (0.38, 0.91)* | 0.54 (0.35, 0.84)* | 31.6 (221) | 1.06 (0.88, 1.27) | 1.05 (0.87, 1.27) |
| *Diploma* | | | | | | |
| Parent only | 8.6 (53) | - | | 32.4 (112) | | |
| Informal | 8.7 (22) | 1.01 (0.59, 1.73) | 0.90 (0.52, 1.57) | 39.4 (110) | 1.22 (0.95, 1.56) | 1.22 (0.96, 1.55) |
| Formal | 8.5 (15) | 0.99 (0.55, 1.77) | 1.05 (0.59, 1.87) | 35.5 (96) | 1.10 (0.84, 1.44) | 1.14 (0.87, 1.50) |
| *A Level* | | | | | | |
| Parent only | 11.8 (79) | - | | 36.9 (146) | | |
| Informal | 6.5 (20) | 0.55 (0.31, 0.98)* | 0.56 (0.32, 0.98)* | 36.2 (115) | 0.98 (0.79, 1.22) | 0.95 (0.76, 1.19) |
| Formal | 5.9 (11) | 0.50 (0.25, 0.99)* | 0.56 (0.27, 1.14) | 30.4 (84) | 0.83 (0.64, 1.07) | 0.80 (0.62, 1.05) |
| *GCSE A-C* | | | | | | |
| Parent only | 8.3 (253) | - | | 36.0 (690) | | |
| Informal | 7.9 (93) | 0.95 (0.70, 1.28) | 0.89 (0.66, 1.20) | 43.0 (448) | 1.20 (1.05, 1.36)* | 1.16 (1.02, 1.33)* |
| Formal | 9.1 (26) | 1.10 (0.70, 1.71) | 1.11 (0.70, 1.75) | 39.2 (257) | 1.09 (0.93, 1.28) | 1.09 (0.93, 1.27) |
| *GCSE D-G* | | | | | | |
| Parent only | 9.0 (92) | - | | 37.5 (278) | | |
| Informal | 10.8 (40) | 1.20 (0.79, 1.81) | 1.04 (0.67, 1.61) | 35.9 (108) | 0.96 (0.77, 1.20) | 0.96 (0.77, 1.21) |
| Formal | 16.7 (8) | 1.84 (0.90, 3.79) | 2.09 (1.05, 4.17)* | 41.2 (68) | 1.10 (0.87, 1.39) | 1.11 (0.87, 1.41) |
| *No qualifications* | | | | | | |
| Parent only | 5.6 (136) | - | - | 34.6 (516) | | |
| Informal | 8.2 (60) | 1.54 (1.10, 2.16)* | 1.47 (1.06, 2.05)* | 32.9 (125) | 0.95 (0.79, 1.15) | 0.88 (0.73, 1.06) |
| Formal | 9.5 (3) | 1.69 (0.62, 4.57) | 1.78 (0.66, 4.80) | 40.1 (94) | 1.16 (0.95, 1.42) | 1.15 (0.94, 1.42) |
| **Lone parenthood** | | | | | | |
| *Couple family* | | | | | | |
| Parent only | 7.9 (425) | | | 33.7 (1569) | | |
| Informal | 7.8 (154) | 1.00 (0.82, 1.21) | 0.91 (0.74, 1.10) | 38.1 (838) | 1.13 (1.04, 1.24)* | 1.10 (1.00, 1.20)* |
| Formal | 6.4 (81) | 0.81 (0.62, 1.07) | 0.78 (0.58, 1.04) | 34.3 (678) | 1.02 (0.93, 1.12) | 1.02 (0.93, 1.13) |
| *Lone parent* | | | | | | |
| Parent only | 9.2 (124) | | | 40.3 (384) | | |
| Informal | 10.1 (48) | 1.11 (0.74, 1.67) | 1.07 (0.72, 1.60) | 40.8 (187) | 1.01 (0.86, 1.20) | 0.99 (0.84, 1.17) |
| Formal | 13.8 (7) | 1.50 (0.73, 3.08) | 2.00 (0.94, 4.23) | 41.2(159) | 1.02 (0.87, 1.21) | 1.10 (0.93, 1.30) |

| | | | | | | |
|---|---|---|---|---|---|---|
| **IMD (quintiles)^** | | | | | | |
| *Least deprived* | | | | | | |
| Parent only | 8.9 (50) | | | 31.1 (115) | | |
| Informal | 8.5 (11) | 0.96 (0.51, 1.81) | 0.91 (0.49, 1.69) | 32.5 (46) | 0.90 (0.67, 1.22) | 0.87 (0.65, 1.17) |
| Formal | 6.9 (16) | 0.78 (0.45, 1.34) | 0.73 (0.42, 1.28) | 32.2 (103) | 1.07 (0.87, 1.31) | 1.06 (0.86, 1.31) |
| *2* | | | | | | |
| Parent only | 7.8 (45) | | | 30.5 (126) | | |
| Informal | 5.2 (10) | 0.67 (0.33, 1.35) | 0.55 (0.28, 1.07) | 35.5 (67) | 1.05 (0.82, 1.35) | 1.04 (0.81, 1.33) |
| Formal | 4.1 (7) | 0.52 (0.23, 1.17) | 0.51 (0.21, 1.21) | 33.8 (98) | 0.97 (0.78, 1.22) | 0.94 (0.75, 1.18) |
| *3* | | | | | | |
| Parent only | 7.1 (52) | | | 35.3 (200) | | |
| Informal | 7.7 (18) | 1.09 (0.63, 1.87) | 0.97 (0.57, 1.66) | 44.1 (111) | 1.23 (1.02, 1.47)* | 1.20 (1.00, 1.45)* |
| Formal | 6.4 (10) | 0.90 (0.45, 1.78) | 0.82 (0.40, 1.71) | 35.3 (96) | 1.01 (0.82, 1.24) | 1.02 (0.83, 1.26) |
| *4* | | | | | | |
| Parent only | 8.6 (79) | | | 37.7 (265) | | |
| Informal | 8.9 (30) | 1.03 (0.67, 1.57) | 1.01 (0.66, 1.54) | 39.1 (140) | 1.10 (0.93, 1.31) | 1.12 (0.94, 1.33) |
| Formal | 9.3 (13) | 1.08 (0.60, 1.95) | 1.16 (0.61, 2.22) | 39.2 (110) | 1.06 (0.87, 1.29) | 1.11 (0.92, 1.36) |
| *Most deprived* | | | | | | |
| Parent only | 7.5 (116) | | | 34.5 (502) | | |
| Informal | 11.1 (53) | 1.47 (1.05, 2.07)* | 1.32 (0.93, 1.89) | 39.0 (175) | 1.23 (1.06, 1.43)* | 1.16 (1.00, 1.35)* |
| Formal | 11.3 (9) | 1.49 (0.75, 2.98) | 1.67 (0.82, 3.39) | 37.8 (140) | 1.13 (0.95, 1.34) | 1.13 (0.95, 1.34) |

*P=<0.05. ** Adjusted for maternal age, ethnicity, family size, age in months. ^ children living in England only.

Missing at 9 months: injury 22, childcare 123, NS-SEC 245, maternal education 66, area deprivation 2, maternal age 653, ethnicity 48. Missing at 3 years: injury 9, childcare 683, NS-SEC 176, maternal education 31, area deprivation 1, maternal age 428, ethnicity 31.

Excluding children who were looked after by nannies and au pairs

*Table 6A2: Risk ratios (and 95% CIs) for being injured overall and by socio-economic circumstances, excluding nannies and au pairs*

| | *Age 9 months* | |
|---|---|---|
| **Childcare** | **Unadjusted RR** | **Adjusted RR**** |
| **Overall association** | | |
| Parent only | | |
| Informal | 1.03 (0.91, 1.17) | 0.93 (0.81, 1.06) |
| Formal | 0.93 (0.77, 1.13) | 0.88 (0.72, 1.08) |
| **Stratified associations** | | |
| **NS-SEC** | | |
| *Managerial & Professional* | | |
| Parent only | | |
| Informal | 0.89 (0.69, 1.16) | 0.81 (0.63, 1.04) |
| Formal | 0.73 (0.55, 0.97)* | 0.66 (0.49, 0.87)* |
| *Intermediate* | | |
| Parent only | | |
| Informal | 0.76 (0.57, 1.02) | 0.70 (0.52, 0.93)* |
| Formal | 0.98 (0.66, 1.46) | 0.89 (0.60, 1.33) |
| *Routine & Manual* | | |
| Parent only | | |
| Informal | 1.15 (0.95, 1.38) | 1.04 (0.86, 1.26) |
| Formal | 1.46 (0.99, 2.16) | 1.42 (0.96, 2.10) |
| **Education** | | |
| *Degree* | | |
| Parent only | - | - |
| Informal | 0.86 (0.57, 1.32) | 1.07 (0.79, 1.45) |
| Formal | 0.87 (0.52, 1.48) | 0.64 (0.46, 0.90)* |
| *Diploma* | | |
| Parent only | - | - |
| Informal | 0.73 (0.52, 1.03) | 0.79 (0.51, 1.21) |
| Formal | 0.47 (0.27, 0.82)* | 0.84 (0.49, 1.44) |
| *A Level* | | |
| Parent only | - | - |
| Informal | 0.95 (0.76, 1.18) | 0.65 (0.47, 0.90)* |
| Formal | 1.05 (0.74, 1.50) | 0.46 (0.26, 0.80)* |
| *GCSE A-C* | | |
| Parent only | - | - |
| Informal | 1.09 (0.77, 1.56) | 0.87 (0.69, 1.08) |
| Formal | 1.83 (1.03, 3.27)* | 1.02 (0.71, 1.46) |
| *GCSE D-G* | | |
| Parent only | - | - |
| Informal | 1.14 (0.40, 3.25) | 0.94 (0.66, 1.36) |
| Formal | 1.71 (0.30, 9.87) | 1.77 (0.99, 3.18) |
| *No qualifications* | | |
| Parent only | - | - |
| Informal | 1.36 (1.00, 1.84)* | 1.29 (0.96, 1.74) |
| Formal | 1.33 (0.48, 3.72) | 1.15 (0.40, 3.32) |
| **Lone parenthood** | | |
| *Couple family* | | |
| Parent only | | |
| Informal | 1.03 (0.90, 1.19) | 0.91 (0.79, 1.04) |
| Formal | 0.95 (0.77, 1.17) | 0.86 (0.70, 1.07) |

| | | |
|---|---|---|
| *Lone parent* | | |
| Parent only | | |
| Informal | 1.07 (0.78, 1.47) | 1.01 (0.74, 1.39) |
| Formal | 0.90 (0.52, 1.56) | 0.99 (0.57, 1.74) |
| **IMD (quintiles)^** | | |
| *Least deprived* | | |
| Parent only | | |
| Informal | 1.00 (0.66, 1.53) | 0.92 (0.61, 1.40) |
| Formal | 0.82 (0.51, 1.30) | 0.74 (0.47, 1.19) |
| *2* | | |
| Parent only | | |
| Informal | 0.76 (0.50, 1.18) | 0.67 (0.44, 1.03) |
| Formal | 0.84 (0.52, 1.35) | 0.78 (0.48, 1.28) |
| *3* | | |
| Parent only | | |
| Informal | 1.03 (0.71, 1.48) | 0.89 (0.61, 1.29) |
| Formal | 0.76 (0.43, 1.34) | 0.62 (0.34, 1.11) |
| *4* | | |
| Parent only | | |
| Informal | 1.17 (0.88, 1.56) | 1.07 (0.80, 1.44) |
| Formal | 1.08 (0.68, 1.71) | 1.04 (0.64, 1.68) |
| *Most deprived* | | |
| Parent only | | |
| Informal | 1.38 (1.08, 1.77)* | 1.22 (0.94, 1.57) |
| Formal | 1.41 (0.80, 2.48) | 1.33 (0.75, 2.37) |

*P=<0.05. ** Adjusted for maternal age, ethnicity, family size, age in months.
^ children living in England only.
Missing at 9 months: injury 22, childcare 123, NS-SEC 245, maternal education 66, area deprivation 2, maternal age 653, ethnicity 48. Missing at 3 years: injury 9, childcare 683, NS-SEC 176, maternal education 31, area deprivation 1, maternal age 428, ethnicity 31.
Number of nannies/au pairs = 174 (out of total of 2391 formal carers)

# **Appendix 7:** Supplementary information for Chapter 7 "Childcare use and inequalities in breastfeeding"

This appendix contains data from a number of sensitivity analyses described in Chapter 7 (7.4.3).

Excluding children who were looked after in more than one type of childcare

*Table 7A1: Risk ratios (and 95% CIs) for being breastfed for at least 4 months, according to childcare commencing before the age of 4 months, overall and by SECs: limited to children who were only looked after in one type of childcare between birth and 9 months*

| **Breastfed for at least 4 months, according to childcare commencing before age 4 months Limited to children who were only looked after in one type of childcare** | | | |
|---|---|---|---|
| | *%(N) breastfed* | *RR* | *ARR^^* |
| **Overall association** | | | |
| Parent only | 34.8 (4086) | - | |
| Informal | 14.9 (95) | 0.43 (0.35, 0.53)* | 0.52 (0.42, 0.65)* |
| Formal | 33.5 (74) | 0.96 (0.80, 1.16) | 0.87 (0.73, 1.04) |
| **Stratified by hours** | | | |
| Parent only | 34.8 (4086) | | |
| Informal P/T | 14.8 (70) | 0.43 (0.34, 0.53)* | 0.57 (0.45, 0.71)* |
| Informal F/T | 15.2 (25) | 0.44 (0.29, 0.66)* | 0.44 (0.28, 0.70)* |
| Formal P/T | 37.9 (43) | 1.09 (0.86, 1.39) | 1.05 (0.82, 1.35) |
| Formal F/T | 28.5 (31) | 0.82 (0.59, 1.14) | 0.72 (0.52, 0.98)* |
| **Stratified by SECs** | | | |
| **Routine & Manual** | | | |
| Parent only | 21.8 (1087) | | |
| Informal | 10.1 (26) | 0.46 (0.30, 0.71)* | 0.57 (0.35, 0.91)* |
| Formal | 9.0 (3) | 0.41 (0.14, 1.24) | 0.40 (0.13, 1.28) |
| Intermediate | | | |
| Parent only | 36.9 (894) | | |
| Informal | 17.8 (31) | 0.48 (0.34, 0.67)* | 0.54 (0.38, 0.78)* |
| Formal | 38.2 (17) | 1.03 (0.68, 1.58) | 0.98 (0.66, 1.47) |
| Managerial & Prof | | | |
| Parent only | 52.7 (1683) | | |
| Informal | 18.4 (35) | 0.35 (0.24, 0.50)* | 0.45 (0.31, 0.64)* |
| Formal | 37.6 (49) | 0.71 (0.56, 0.91)* | 0.78 (0.61, 0.99)* |
| **Education** | | | |
| *No qualifications* | | | |
| Parent only | 17.1 (454) | | |
| Informal | 2.4 (4) | 0.14 (0.05, 0.36)* | 0.17 (0.05, 0.57)* |
| Formal | 33.0 (4) | 1.94 (0.73, 5.17) | 3.18 (1.28, 7.92)* |
| *GCSE D-G* | | | |
| Parent only | 15.5 (204) | | |
| Informal | 7.1 (4) | 0.46 (0.17, 1.23) | 0.50 (0.18, 1.36) |
| Formal | 10.9 (1) | 0.70 (0.11, 4.39) | 0.61 (0.13, 2.97) |
| *GCSE A-C* | | | |
| Parent only | 26.2 (1030) | | |
| Informal | 10.2 (25) | 0.39 (0.26, 0.59)* | 0.45 (0.29, 0.71)* |

| | | | |
|---|---|---|---|
| Formal | 24.9 (14) | 0.95 (0.57, 1.58) | 0.93 (0.56, 1.54) |
| *A Levels* | | | |
| Parent only | 45.6 (478) | | |
| Informal | 26.2 (16) | 0.57 (0.37, 0.90)* | 0.83 (0.54, 1.27) |
| Formal | 37.3 (9) | 0.82 (0.48, 1.40) | 1.03 (0.55, 1.96) |
| *Diploma* | | | |
| Parent only | 43.4 (436) | | |
| Informal | 24.0 (16) | 0.55 (0.33, 0.92)* | 0.64 (0.39, 1.06) |
| Formal | 13.7 (4) | 0.32 (0.11, 0.87)* | 0.32 (0.11, 0.95)* |
| *Degree plus* | | | |
| Parent only | 65.6 (1279) | | |
| Informal | 37.6 (26) | 0.57 (0.40, 0.81)* | 0.66 (0.45, 0.97)* |
| Formal | 47.8 (42) | 0.73 (0.58, 0.92)* | 0.75 (0.60, 0.95)* |
| **Lone parenthood** | | | |
| *Lone parent* | | | |
| Parent only | 18.0 (354) | | |
| Informal | 8.1 (12) | 0.45 (0.22, 0.93) | 0.46 (0.24, 0.92)* |
| Formal | 29.1 (10) | 1.62 (0.89, 2.93) | 1.40 (0.70, 2.80) |
| *Couple family* | | | |
| Parent only | 37.4 (3732) | - | - |
| Informal | 16.2 (83) | 0.53 (0.42, 0.67)* | 0.43 (0.35, 0.54)* |
| Formal | 34.1 (64) | 0.85 (0.70, 1.03) | 0.91 (0.75, 1.11) |
| **IMD (quintiles)^** | | | |
| *Most deprived* | | | |
| Parent only | 24.4 (782) | | |
| Informal | 17.8 (19) | 0.73 (0.45, 1.18) | 0.82 (0.49, 1.39) |
| Formal | 17.2 (6) | 0.71 (0.31, 1.60) | 0.58 (0.23, 1.48) |
| *4* | | | |
| Parent only | 30.1 (571) | | |
| Informal | 17.1 (17) | 0.57 (0.35, 0.92)* | 0.64 (0.37, 1.09) |
| Formal | 25.4 (10) | 0.84 (0.47, 1.51) | 0.75 (0.41, 1.35) |
| *3* | | | |
| Parent only | 34.9 (533) | | |
| Informal | 13.9 (12) | 0.40 (0.22, 0.73)* | 0.51 (0.28, 0.93)* |
| Formal | 42.6 (13) | 1.22 (0.79, 1.90) | 1.36 (0.88, 2.10) |
| *2* | | | |
| Parent only | 50.0 (505) | | |
| Informal | 12.4 (6) | 0.27 (0.12, 0.58)* | 0.35 (0.16, 0.75)* |
| Formal | 34.2 (11) | 0.74 (0.46, 1.20) | 0.69 (0.43, 1.10) |
| *Least deprived* | | | |
| Parent only | 48.0 (509) | | |
| Informal | 19.7 (7) | 0.41 (0.21, 0.80)* | 0.50 (0.25, 1.00)* |
| Formal | 41.3 (12) | 0.86 (0.55, 1.34) | 0.89 (0.59, 1.33) |

*p=<0.05. ^England only ^^adjusting for mother's ethnicity, parity and age at first live birth and whether the mother returned to work before the infant was age 4 months.

Exploring childcare in relation to breastfeeding initiation (as opposed to duration)

*Table 7A2: A Risk ratios (and 95% CIs) for breastfed initiation, according to childcare commencing before the age of 4 months, overall and by SECs*

| **Breastfeeding initiation according to childcare commencing before age 4 months** | | | |
|---|---|---|---|
| | *Col A* | *Col B* | *Col C* |
| | *%(N) breastfed* | *RR* | *ARR^^* |
| **Overall association** | | | |
| Parent only | 70.2 (10810) | | |
| Informal | 58.5 (782) | 0.83 (0.79, 0.88)* | 0.87 (0.82, 0.91)* |
| Formal | 80.5 (275) | 1.15 (1.08, 1.22)* | 1.05 (0.98, 1.12) |
| | | | |
| Parent only | 70.2 (10810) | | |
| Informal P/T | 56.8 (606) | 0.81 (0.76, 0.86)* | 0.85 (0.79, 0.91)* |
| Informal F/T | 65.4 (176) | 0.93 (0.85, 1.02) | 0.93 (0.85, 1.02) |
| Formal P/T | 86.1 (157) | 1.23 (1.15, 1.31)* | 1.13 (1.05, 1.20)* |
| Formal F/T | 74.2 (118) | 1.06 (0.96, 1.17) | 0.96 (0.87, 1.06) |
| **Stratified by SECs** | | | |
| **NS-SEC** | | | |
| **Routine & Manual** | | | |
| Parent only | 58.0 (377) | | |
| Informal | 48.4 (305) | 0.83 (0.76, 0.92)* | 0.82 (0.75, 0.91)* |
| Formal | 69.7 (37) | 1.20 (0.97, 1.49) | 1.08 (0.86, 1.36) |
| **Intermediate** | | | |
| Parent only | 74.4 (2307) | | |
| Informal | 64.4 (198) | 0.87 (0.78, 0.96)* | 0.89 (0.80, 0.99)* |
| Formal | 77.5 (60) | 1.04 (0.92, 1.18) | 1.02 (0.90, 1.15) |
| **Managerial & Prof** | | | |
| Parent only | 86.9 (3566) | | |
| Informal | 73.1 (203) | 0.84 (0.78, 0.91)* | 0.88 (0.81, 0.95)* |
| Formal | 84.4 (167) | 0.97 (0.91, 1.04) | 0.97 (0.91, 1.04) |
| **Education** | | | |
| *No qualifications* | | | |
| Parent only | 48.4 (1578) | - | |
| Informal | 44.6 (108) | 0.92 (0.79, 1.08) | 0.92 (0.79, 1.08) |
| Formal | 73.3 (11) | 1.52 (1.09, 2.12)* | 1.75 (1.21, 2.54)* |
| *GCSE D-G* | | | |
| Parent only | 80.2 (904) | - | |
| Informal | 68.8 (84) | 0.83 (0.68, 1.01) | 0.83 (0.67, 1.02) |
| Formal | 10.0 (11) | 1.14 (0.78, 1.67) | 1.05 (0.71, 1.54) |
| *GCSE A-C* | | | |
| Parent only | 54.9 (3305) | - | |
| Informal | 45.5 (303) | 0.87 (0.81, 0.94)* | 0.88 (0.81, 0.95)* |
| Formal | 62.6 (61) | 1.04 (0.88, 1.24) | 0.97 (0.81, 1.17) |
| *A Levels* | | | |
| Parent only | 65.3 (1173) | | |
| Informal | 57.0 (89) | 0.84 (0.74, 0.95)* | 0.88 (0.77, 1.01) |
| Formal | 68.0 (42) | 1.08 (0.99, 1.18) | 1.11 (1.00, 1.22)* |
| *Diploma* | | | |
| Parent only | 82.4 (1081) | - | |
| Informal | 68.9 (79) | 0.89 (0.79, 1.01) | 0.93 (0.81, 1.06) |
| Formal | 89.1 (32) | 1.00 (0.86, 1.17) | 0.99 (0.85, 1.16) |
| *Degree plus* | | | |

| | | | |
|---|---|---|---|
| Parent only | 82.1 (2373) | - | - |
| Informal | 73.3 (94) | 0.92 (0.86, 1.00)* | 0.95 (0.88, 1.02) |
| Formal | 82.5 (113) | 0.93 (0.85, 1.02) | 0.94 (0.86, 1.02) |
| **Lone parenthood** | | | |
| *Lone parent* | | | |
| Parent only | 48.5 (1297) | - | - |
| Informal | 44.7 (125) | 0.84 (0.79, 0.89)* | 0.93 (0.78, 1.10) |
| Formal | 74.5 (46) | 1.11 (1.04, 1.18)* | 1.33 (1.07, 1.66)* |
| *Couple family* | | | |
| Parent only | 73.7 (9513) | - | - |
| Informal | 61.9 (657) | 0.92 (0.78, 1.10) | 0.87 (0.81, 0.92)* |
| Formal | 81.7 (229) | 1.54 (1.27, 1.85)* | 1.03 (0.97, 1.10) |
| **IMD (quintiles)^** | | | |
| *Most deprived* | | | |
| Parent only | 60.1 (2365) | - | - |
| Informal | 49.6 9174) | 0.83 (0.73, 0.94)* | 0.85 (0.75, 0.96)* |
| Formal | 63.6 (26) | 1.06 (0.79, 1.41) | 1.02 (0.72, 1.43) |
| *4* | | | |
| Parent only | 65.1 (1476) | - | - |
| Informal | 60.4 (124) | 0.93 (0.82, 1.05) | 0.89 (0.79, 1.02) |
| Formal | 82.1 (41) | 1.26 (1.11, 1.44)* | 1.15 (1.00, 1.32) |
| *3* | | | |
| Parent only | 73.6 (1297) | - | - |
| Informal | 63.5 (86) | 0.86 (0.75, 0.99)* | 0.86 (0.75, 0.99)* |
| Formal | 83.4 (36) | 1.13 (0.96, 1.33) | 1.06 (0.89, 1.27) |
| *2* | | | |
| Parent only | 79.4 (1089) | - | - |
| Informal | 75.5 (58) | 0.95 (0.83, 1.08) | 0.98 (0.85, 1.12) |
| Formal | 89.4 (45) | 1.12 (1.02, 1.24) | 1.07 (0.97, 1.18) |
| *Least deprived* | | | |
| Parent only | 84.7 (1093) | - | - |
| Informal | 75.0 (36) | 0.88 (0.75, 1.04) | 0.90 (0.76, 1.07) |
| Formal | 85.1 (39) | 1.00 (0.89, 1.14) | 0.98 (0.87, 1.11) |

*p=<0.05. ^England only ^^adjusting for mother's ethnicity, parity and age at first live birth and whether the mother returned to work before the infant was age 4 months.

Are differential associations by SECs explained by differing durations of childcare use?

*Table 7A3: Risk ratios (and 95% CIs) for being breastfed for at least 4 months, according to childcare commencing before the age of 4 months, overall and stratified by childcare duration*

| **Breastfed for at least 4 months, according to childcare commencing before age 4 months** | | | | |
|---|---|---|---|---|
| **Stratified by full-time and part-time care** | | | | |
| | *Part-time* | | *Full-time* | |
| | *RR* | *ARR^^* | *RR* | *ARR^^* |
| **NS-SEC** | | | | |
| **Routine & Manual** | | | | |
| Parent only | | | | |
| Informal | 0.38 (0.27, 0.54)* | 0.49 (0.35, 0.70)* | 0.46 (0.21, 1.00)* | 0.41 (0.15, 1.11) |
| Formal | 0.33 (0.11, 0.97)* | 0.31 (0.10, 1.01) | 1.36 (0.47, 3.92) | 1.40 (0.42, 4.65) |
| **Intermediate** | | | | |
| Parent only | | | | |
| Informal | 0.45 (0.33, 0.61)* | 0.52 (0.38, 0.72)* | 0.38 (0.17, 0.86)* | 0.42 (0.19, 0.89)* |
| Formal | 1.00 (0.63, 1.59) | 0.98 (0.63, 1.51) | 0.59 (0.27, 1.30) | 0.63 (0.30, 1.30) |
| **Managerial & Prof** | | | | |
| Parent only | | | | |
| Informal | 0.47 (0.36, 0.62)* | 0.62 (0.47, 0.81)* | 0.23 (0.12, 0.420* | 0.29 (0.16, 0.53)* |
| Formal | 0.94 (0.74, 1.20) | 1.07 (0.82, 1.39) | 0.52 (0.36, 0.75)* | 0.56 (0.39, 0.80)* |
| **Education** | | | | |
| *No qualifications* | | | | |
| Parent only | | | | |
| Informal | 0.45 (0.27, 0.76)* | 0.50 (0.30, 0.85)* | 0.16 (0.05, 0.57)* | 0.12 (0.02, 0.79)* |
| Formal | 1.57 (0.58, 4.20) | 2.51 (1.04, 6.05) | 0.43 (0.05, 3.62) | 0.86 (0.11, 6.62) |
| *GCSE D-G* | | | | |
| Parent only | | | | |
| Informal | 0.39 (0.19, 0.80)* | 0.50 (0.25, 1.03) | 0.33 (0.05, 2.18) | 0.38 (0.06, 2.54) |
| Formal | 0.68 (0.11, 4.18) | 0.58 (0.12, 2.82) | 0.00 (0.00, 0.00)* | 0.00 (0.00, 0.00)* |
| *GCSE A-C* | | | | |
| Parent only | | | | |
| Informal | 0.31 (0.21, 0.44)* | 0.36 (0.24, 0.53)* | 0.26 (0.11, 0.63)* | 0.32 (0.14, 0.72)* |
| Formal | 0.94 (0.56, 1.56) | 1.02 (0.60, 1.72) | 0.69 (0.31, 1.53) | 0.66 (0.32, 1.37) |
| *A Levels* | | | | |
| Parent only | | | | |
| Informal | 0.50 (0.32, 0.76)* | 0.64 (0.41, 1.00)* | 0.36 (0.15, 0.84)* | 0.48 (0.22, 1.07) |
| Formal | 1.03 (0.59, 1.79) | 1.30 (0.78, 2.17) | 0.74 (0.41, 1.34) | 0.90 (0.46, 1.75) |
| *Diploma* | | | | |
| Parent only | | | | |
| Informal | 0.59 (0.38, 0.89)* | 0.71 (0.48, 1.07) | 0.54 (0.21, 1.40) | 0.52 (0.23, 1.16) |
| Formal | 0.38 (0.16, 0.89)* | 0.40 (0.15, 1.04) | 0.37 (0.10, 1.38) | 0.41 (0.11, 1.52) |
| *Degree plus* | | | | |
| Parent only | | | | |
| Informal | 0.81 (0.65, 1.02) | 0.94 (0.74, 1.20) | 0.51 (0.28, 0.93)* | 0.60 (0.31, 1.14) |
| Formal | 0.88 (0.69, 1.11) | 0.90 (0.69, 1.18) | 0.50 (0.34, 0.74)* | 0.52 (0.36, 0.76)* |
| **Lone parenthood** | | | | |
| *Lone parent* | | | | |
| Parent only | | | | |
| Informal | 0.33 (0.19, 0.57)* | 0.35 (0.20, 0.61)* | 0.61 (0.22, 1.68) | 0.67 (0.25, 1.80) |

| | | | | |
|---|---|---|---|---|
| Formal | 1.77 (1.01, 3.13)* | 1.88 (1.03, 3.44)* | 2.26 (1.21, 4.21)* | 1.39 (0.75, 2.57) |
| *Couple family* | | | | |
| Parent only | | | | |
| Informal | 0.44 (0.37, 0.52) | 0.57 (0.48, 0.68)* | 0.35 (0.23, 0.54)* | 0.40 (0.25, 0.63)* |
| Formal | 1.01 (0.82, 1.26) | 0.98 (0.79, 1.22) | 0.65 (0.46, 0.92)* | 0.60 (0.42, 0.85)* |
| **IMD (quintiles)^** | | | | |
| *Most deprived* | | | | |
| Parent only | | | | |
| Informal | 0.55 (0.40, 0.76)* | 0.71 (0.51, 0.99)* | 0.87 (0.45, 1.69) | 0.76 (0.40, 1.45) |
| Formal | 0.58 (0.21, 1.59) | 0.52 (0.16, 1.71) | 0.92 (0.35, 2.42) | 0.83 (0.33, 2.14) |
| *4* | | | | |
| Parent only | | | | |
| Informal | 0.49 (0.32, 0.74)* | 0.56 (0.36, 0.89)* | 0.53 (0.23, 1.19) | 0.49 (0.21, 1.15) |
| Formal | 0.96 (0.48, 1.91) | 1.00 (0.49, 2.03) | 1.45 (0.91, 2.33) | 1.19 (0.69, 2.06) |
| *3* | | | | |
| Parent only | | | | |
| Informal | 0.37 (0.22, 0.63)* | 0.50 (0.30, 0.85)* | 0.49 (0.21, 1.14) | 0.58 (0.25, 1.34) |
| Formal | 1.51 (0.98, 2.31) | 1.89 (1.26, 2.85) | 0.84 (0.42, 1.68) | 0.85 (0.44, 1.64) |
| *2* | | | | |
| Parent only | | | | |
| Informal | 0.40 (0.23, 0.69)* | 0.48 (0.28, 0.82)* | 0.00 (0.00, 0.00) | 0.00 (0.00, 0.00) |
| Formal | 1.16 (0.78, 1.70) | 1.16 (0.78, 1.72) | 0.35 (0.14, 0.85) | 0.33 (0.14, 0.76)* |
| *Least deprived* | | | | |
| Parent only | | | | |
| Informal | 0.45 (0.24, 0.84)* | 0.55 (0.29, 1.05) | 0.20 (0.03, 1.31) | 0.25 (0.04, 1.66) |
| Formal | 0.64 (0.36, 1.16) | 0.63 (0.36, 1.11) | 0.62 (0.32, 1.23) | 0.68 (0.35, 1.33) |

*p=<0.05; ^ England only; ^^adjusting for mother's ethnicity, parity and age at first live birth and whether the mother returned to work before the infant was age 4 months

Looking at any exposure to childcare (as opposed to childcare lasting more than 10 hours a week)

*Table 7A4: Risk ratios (and 95% CIs) for being breastfed for at least 4 months, according to childcare commencing before the age of 4 months (without a 10 hour cut-off), overall and by SECs*

| **Breastfed for at least 4 months, according to childcare commencing before age 4 months**<br>**Not limited to childcare lasting at least 10 hours a week** | | | |
|---|---|---|---|
| | *%(N) breastfed* | *RR* | *ARR^^* |
| **Overall association** | | | |
| Parent only | 35.1 (4754) | | |
| Informal | 16.8 (432) | 0.48 (0.43, 0.53)* | 0.59 (0.53, 0.66) |
| Formal | 34.3 (139) | 0.98 (0.84, 1.13) | 0.90 (0.78, 1.04) |
| **Stratified by SECs** | | | |
| **NS-SEC** | | | |
| *Routine & Manual* | | | |
| Parent only | 21.9 (1235) | | |
| Informal | 10.7 (129) | 0.49 (0.40, 0.58)* | 0.58 (0.48, 0.71)* |
| Formal | 18.3 (10) | 0.83 (0.45, 1.54) | 0.82 (0.42, 1.59) |
| *Intermediate* | | | |
| Parent only | 37.4 (1043) | | |
| Informal | 20.8 (105) | 0.55 (0.45, 0.66)* | 0.60 (0.50, 0.73)* |
| Formal | 33.1 (29) | 0.89 (0.63, 1.25) | 0.91 (0.66, 1.28) |
| *Managerial & Prof* | | | |
| Parent only | 52.7 (1997) | | |
| Informal | 26.3 (116) | 0.50 (0.42, 0.59)* | 0.60 (0.51, 0.71)* |
| Formal | 38.7 (91) | 0.73 (0.62, 0.87)* | 0.79 (0.66, 0.94)* |
| **Education** | | | |
| *No qualifications* | | | |
| Parent only | 17.2 (506) | | |
| Informal | 10.3 (73) | 0.60 (0.43, 0.85)* | 0.58 (0.43, 0.79)* |
| Formal | 31.4 (7) | 1.83 (0.88, 3.81) | 2.49 (1.28, 4.83)* |
| *GCSE D-G* | | | |
| Parent only | 16.2 (244) | | |
| Informal | 11.4 (35) | 0.70 (0.47, 1.04) | 0.82 (0.56, 1.22) |
| Formal | 8.6 (2) | 0.53 (0.10, 2.87) | 0.47 (0.10, 2.12) |
| *GCSE A-C* | | | |
| Parent only | 26.5 (1180) | | |
| Informal | 11.0 (103) | 0.42 (0.33, 0.52)* | 0.50 (0.40, 0.62)* |
| Formal | 21.0 (19) | 0.79 (0.52, 1.21) | 0.84 (0.55, 1.27) |
| *A Levels* | | | |
| Parent only | 45.0 (553) | | |
| Informal | 25.1 (53) | 0.56 (0.43, 0.73)* | 0.70 (0.53, 0.91)* |
| Formal | 32.7 (19) | 0.73 (0.48, 1.10) | 0.88 (0.57, 1.36) |
| *Diploma* | | | |
| Parent only | 44.1 (532) | | |
| Informal | 20.3 (39) | 0.46 (0.33, 0.65)* | 0.50 (0.36, 0.69)* |
| Formal | 19.9 (10) | 0.45 (0.24, 0.83)* | 0.45 (0.24, 0.85)* |
| *Degree plus* | | | |
| Parent only | 65.2(1513) | | |

| | | | |
|---|---|---|---|
| Informal | 51.3 (104) | 0.79 (0.68, 0.91)* | 0.87 (0.75, 1.02) |
| Formal | 51.7 (81) | 0.79 (0.67, 0.94)* | 0.82 (0.69, 0.97)* |
| **Lone parenthood** | | | |
| *Lone parent* | | | |
| Parent only | 18.3 (422) | | |
| Informal | 7.1 (40) | 0.39 (0.27, 0.56)* | 0.45 (0.31, 0.64)* |
| Formal | 31.2 (21) | 1.70 (1.10, 2.63)* | 1.51 (0.97, 2.34) |
| *Couple family* | | | |
| Parent only | 37.8 (4332) | | |
| Informal | 19.0 (392) | 0.50 (0.45, 0.56)* | 0.61 (0.55, 0.69)* |
| Formal | 34.8 (118) | 0.92 (0.79, 1.08) | 0.87 (0.75, 1.02) |
| **IMD (quintiles)^** | | | |
| *Most deprived* | | | |
| Parent only | 24.8 (920) | | |
| Informal | 15.5 (130) | 0.62 (0.51, 0.76)* | 0.71 (0.58, 0.87)* |
| Formal | 22.3 (13) | 0.90 (0.52, 1.55) | 0.86 (0.47, 1.61) |
| *4* | | | |
| Parent only | 29.7 (650) | | |
| Informal | 18.9 (80) | 0.64 (0.50, 0.80)* | 0.71 (0.55, 0.91)* |
| Formal | 33.7 (21) | 1.13 (0.77, 1.67) | 1.06 (0.70, 1.60) |
| *3* | | | |
| Parent only | 36.3 (620) | | |
| Informal | 16.7 (50) | 0.46 (0.34, 0.61)* | 0.57 (0.43, 0.76)* |
| Formal | 45.2 (26) | 1.25 (0.91, 1.70) | 1.34 (0.99, 1.81) |
| *2* | | | |
| Parent only | 46.0 (595) | | |
| Informal | 22.4 (35) | 0.49 (0.36, 0.66)* | 0.60 (0.44, 0.82)* |
| Formal | 35.0 (19) | 0.76 (0.53, 1.09) | 0.74 (0.52, 1.05) |
| *Least deprived* | | | |
| Parent only | 32.7 (588) | | |
| Informal | 14.8 (27) | 0.45 (0.41, 0.50)* | 0.56 (0.50, 0.62)* |
| Formal | 30.6 (24) | 0.94 (0.81, 1.09) | 0.86 (0.74, 0.99)* |

*P<=0.05; ^England only; ^^adjusting for mother's ethnicity, parity and age at first live birth and whether the mother returned to work before the infant was age 4 months

# **Appendix 8:** Supplementary information for Chapter 8 "Childcare use and inequalities in overweight"

This appendix contains data from a number of sensitivity analyses conducted for Chapter 8, described in section 8.4.4

Excluding children who were looked after in more than one type of childcare

*Table 8A1: Risk ratio for being overweight or obese, according to childcare type and limited to children looked after in only one type of childcare*

| **Childcare** | **% (N)** | **Unadjusted RR** | **Adjusted RR [1]** |
|---|---|---|---|
| **Overall analysis** | | | |
| Parent only | 22.2 (1520) | - | - |
| Informal | 23.7 (456) | 1.07 (0.96, 1.19) | 1.09 (0.97, 1.23) |
| Formal | 23.6 (404) | 1.06 (0.95, 1.19) | 1.10 (0.97, 1.25) |
| **Stratified by SECs** | | | |
| **NS-SEC** | | | |
| *Routine & Manual* | | | |
| Parent only | 23.3 (790) | | |
| Informal | 23.7 (189) | 1.02 (0.85, 1.23) | 1.06 (0.88, 1.28) |
| Formal | 26.2 (104) | 1.12 (0.93, 1.36) | 1.13 (0.93, 1.38) |
| *Intermediate* | | | |
| Parent only | 19.3 (242) | | |
| Informal | 21.7 (108) | 1.12 (0.90, 1.41) | 1.13 (0.88, 1.43) |
| Formal | 20.4 (68) | 1.05 (0.81, 1.37) | 1.04 (0.79, 1.35) |
| *Managerial & Prof* | | | |
| Parent only | 22.0 (270) | | |
| Informal | 25.1 (139) | 1.14 (0.93, 1.40) | 1.11 (0.89, 1.38) |
| Formal | 23.4 (201) | 1.06 (0.88, 1.29) | 1.13 (0.93, 1.37) |
| **Education** | | | |
| *No qualifications* | | | |
| Parent only | 24.6 (385) | | |
| Informal | 22.4 (44) | 0.91 (0.66, 1.27) | 0.96 (0.68, 1.34) |
| Formal | 23.3 (43) | 0.95 (0.66, 1.36) | 1.10 (0.74, 1.62) |
| *GCSE D-G* | | | |
| Parent only | 25.8 (205) | | |
| Informal | 22.8 (46) | 0.89 (0.65, 1.21) | 0.98 (0.71, 1.35) |
| Formal | 25.8 (24) | 1.00 (0.66, 1.52) | 0.93 (0.58, 1.47) |
| GCSE A-C | | | |
| Parent only | 21.6 (527) | | |
| Informal | 24.8 (193) | 1.15 (0.97, 1.36) | 1.16 (0.97, 1.39) |
| Formal | 23.4 (106) | 1.08 (0.86, 1.37) | 1.09 (0.85, 1.39) |
| *A/AS Levels* | | | |
| Parent only | 16.8 (98) | | |
| Informal | 18.4 (46) | 1.09 (0.74, 1.61) | 1.09 (0.73, 1.63) |
| Formal | 30.1 (49) | 1.79 (1.24, 2.59)* | 1.65 (1.13, 2.40)* |
| *Diploma* | | | |
| Parent only | 22.5 (107) | | |
| Informal | 21.9 (49) | 0.98 (0.66, 1.44) | 1.01 (0.69, 1.47) |
| Formal | 23.7 (50) | 1.05 (0.74, 1.50) | 1.11 (0.78, 1.58) |
| *Degree* | | | |

| | | | |
|---|---|---|---|
| Parent only | 19.8 (150) | | |
| Informal | 29.7 (73) | 1.50 (1.15, 1.96)* | 1.38 (1.04, 1.84)* |
| Formal | 20.8 (124) | 1.05 (0.82, 1.35) | 1.01 (0.77, 1.34) |
| **Lone parenthood** | | | |
| *Lone parent* | | | |
| Parent only | 24.6 (279) | | |
| Informal | 25.5 (69) | 1.03 (0.79, 1.36) | 0.98 (0.73, 1.33) |
| Formal | 26.2 (77) | 1.06 (0.83, 1.37) | 1.09 (0.85, 1.40) |
| *Couple family* | | | |
| Parent only | 21.7 (1241) | | |
| Informal | 23.4 (387) | 1.08 (0.95, 1.22) | 1.11 (0.97, 1.27) |
| Formal | 23.1 (327) | 1.07 (0.94, 1.21) | 1.11 (0.96, 1.27) |
| **IMD (quintiles) **** | | | |
| *Most deprived* | | | |
| Parent only | 23.2 (349) | | |
| Informal | 25.3 (64) | 1.09 (0.85, 1.40) | 1.13 (0.87, 1.48) |
| Formal | 22.6 (54) | 0.98 (0.74, 1.29) | 0.97 (0.71, 1.32) |
| *Fourth* | | | |
| Parent only | 24.0 (208) | | |
| Informal | 24.7 (54) | 1.03 (0.78, 1.36) | 1.03 (0.77, 1.38) |
| Formal | 26.3 (48) | 1.09 (0.81, 1.48) | 1.11 (0.81, 1.52) |
| *Third* | | | |
| Parent only | 20.2 (147) | | |
| Informal | 26.5 (50) | 1.31 (0.97, 1.77) | 1.38 (1.01, 1.87)* |
| Formal | 23.3 (46) | 1.15 (0.84, 1.59) | 1.16 (0.83, 1.61) |
| *Second* | | | |
| Parent only | 18.8 (112) | | |
| Informal | 24.8 (31) | 1.32 (0.92, 1.89) | 1.17 (0.80, 1.71) |
| Formal | 21.2 (40) | 1.13 (0.81, 1.57) | 1.11 (0.79, 1.58) |
| *Least deprived* | | | |
| Parent only | 20.6 (129) | | |
| Informal | 10.9 (12) | 0.53 (0.30, 0.93) | 0.53 (0.30, 0.95) |
| Formal | 22.5 (59) | 1.09 (0.83, 1.45) | 1.18 (0.87, 1.58) |

*<=0.05. **England only. [1] Adjusting for maternal age, ethnicity, number of children in household at age 3 years, pre-pregnancy maternal overweight, birth weight, smoking during pregnancy, NS-SEC, maternal education and lone parenthood, age in months

Missing: BMI 1247, childcare 926, NS-SEC 176, maternal education 31, maternal age at first live birth 428, ethnicity 31, maternal pre-pregnancy overweight 886, birthweight z score 169, smoking during pregnancy 60, no children in household 51, age 51

Exploring all childcare (i.e. including childcare lasting less than 10 hours a week)

*Table 8A2: Risk ratio for being overweight or obese, according to childcare which lasted any amount of time (as opposed to at least 10 hours a week)*

| Childcare | % (N) | Unadjusted RR | Adjusted RR [1] |
|---|---|---|---|
| **Overall analysis** | | | |
| Parent only | 22.6 (1181) | - | - |
| Informal | 24.4 (1020) | 1.08 (0.99, 1.18) | 1.09 (1.00, 1.20) |
| Formal | 22.4 (758) | 0.99 (0.90, 1.09) | 1.02 (0.92, 1.13) |
| **Stratified by SECs** | | | |
| **NS-SEC** | | | |
| *Routine & Manual* | | | |
| Parent only | 22.9 (620) | | |
| Informal | 25.7 (426) | 1.12 (1.00, 1.26) | 1.13 (0.99, 1.29) |
| Formal | 24.9 (205) | 1.09 (0.94, 1.27) | 1.08 (0.92, 1.28) |
| *Intermediate* | | | |
| Parent only | 20.4 (181) | | |
| Informal | 21.4 (239) | 1.05 (0.87, 1.26) | 1.06 (0.87, 1.29) |
| Formal | 20.3 (149) | 1.00 (0.82, 1.21) | 1.02 (0.83, 1.25) |
| *Managerial & Prof* | | | |
| Parent only | 23.5 (186) | | |
| Informal | 26.0 (314) | 1.11 (0.93, 1.32) | 1.09 (0.91, 1.31) |
| Formal | 21.6 (353) | 0.92 (0.78, 1.09) | 0.95 (0.80, 1.14) |
| **Education** | | | |
| *No qualifications* | | | |
| Parent only | 23.9 (326) | | |
| Informal | 27.4 (120) | 1.15 (0.91, 1.44) | 1.18 (0.93, 1.49) |
| Formal | 25.3 (72) | 1.06 (0.80, 1.41) | 1.15 (0.85, 1.54) |
| *GCSE D-G* | | | |
| Parent only | 26.8 (167) | | |
| Informal | 27.1 (105) | 1.01 (0.81, 1.27) | 1.09 (0.86, 1.37) |
| Formal | 22.8 (53) | 0.85 (0.62, 1.18) | 0.80 (0.57, 1.11) |
| GCSE A-C | | | |
| Parent only | 22.0 (407) | | |
| Informal | 23.8 (404) | 1.08 (0.94, 1.25) | 1.09 (0.93, 1.26) |
| Formal | 23.0 (218) | 1.05 (0.88, 1.25) | 1.08 (0.89, 1.30) |
| *A/AS Levels* | | | |
| Parent only | 18.3 (70) | | |
| Informal | 21.3 (106) | 1.15 (0.82, 1.62) | 1.07 (0.76, 1.51) |
| Formal | 21.5 (81) | 1.16 (0.83, 1.62) | 1.08 (0.77, 1.52) |
| *Diploma* | | | |
| Parent only | 21.4 (67) | | |
| Informal | 22.8 (112) | 1.06 (0.78, 1.44) | 1.03 (0.76, 1.39) |
| Formal | 24.2 (197) | 1.13 (0.82, 1.56) | 1.09 (0.79, 1.51) |
| *Degree* | | | |
| Parent only | 20.3 (101) | | |
| Informal | 26.7 (161) | 1.31 (1.02, 1.69)* | 1.25 (0.95, 1.66) |
| Formal | 20.5 (224) | 1.01 (0.79, 1.28) | 0.97 (0.75, 1.26) |
| **Lone parenthood** | | | |
| *Lone parent* | | | |
| Parent only | 24.1 | | |

| | | | |
|---|---|---|---|
| Informal | 25.1 | 1.04 (0.83, 1.30) | 1.03 (0.80, 1.32) |
| Formal | 26.8 | 1.11 (0.89, 1.39) | 1.12 (0.88, 1.43) |
| *Couple family* | | | |
| Parent only | 22.3 | | |
| Informal | 24.3 | 1.09 (0.99, 1.20) | 1.11 (1.01, 1.23)* |
| Formal | 21.6 | 0.97 (0.88, 1.07) | 1.00 (0.89, 1.11) |
| **IMD (quintiles) **** | | | |
| *Most deprived* | | | |
| Parent only | 23.0 (298) | - | |
| Informal | 26.0 (136) | 1.13 (0.94, 1.37) | 1.16 (0.94, 1.43) |
| Formal | 23.6 (95) | 1.03 (0.82, 1.28) | 1.03 (0.81, 1.33) |
| *Fourth* | | | |
| Parent only | 24.9 (155) | - | |
| Informal | 25.1 (139) | 1.01 (0.81, 1.25) | 1.03 (0.82, 1.30) |
| Formal | 24.3 (96) | 0.98 (0.76, 1.25) | 0.95 (0.74, 1.23) |
| *Third* | | | |
| Parent only | 20.6 (109) | - | |
| Informal | 25.6 (127) | 1.24 (0.97, 1.58) | 1.25 (0.98, 1.60) |
| Formal | 21.5 (89) | 1.04 (0.80, 1.36) | 1.01 (0.77, 1.32) |
| *Second* | | | |
| Parent only | 18.1 (71) | - | |
| Informal | 23.4 (87) | 1.29 (0.97, 1.73) | 1.20 (0.89, 1.62) |
| Formal | 21.5 (93) | 1.19 (0.89, 1.58) | 1.14 (0.85, 1.51) |
| *Least deprived* | | | |
| Parent only | 21.9 (88) | - | |
| Informal | 19.5 (64) | 0.89 (0.66, 1.19) | 0.90 (0.67, 1.21) |
| Formal | 19.7 (109) | 0.90 (0.70, 1.16) | 0.92 (0.71, 1.20) |

*<=0.05. **England only. [1] Adjusting for maternal age, ethnicity, number of children in household at age 3 years, pre-pregnancy maternal overweight, birth weight, smoking during pregnancy, NS-SEC, maternal education and lone parenthood, age in months

Missing: BMI 1247, childcare 926, NS-SEC 176, maternal education 31, maternal age at first live birth 428, ethnicity 31, maternal pre-pregnancy overweight 886, birthweight z score 169, smoking during pregnancy 60, no children in household 51, age 51

Controlling for time spent in childcare

*Table 8A3: Risk ratio for being overweight or obese, according to childcare type and stratified by part-time and full-time.*

| **Risk ratios for being overweight, according to childcare commencing before age 4 months** | | | | |
|---|---|---|---|---|
| | *P/T* | | *F/T* | |
| | *RR* | *aRR^^* | *RR* | *aRR^^* |
| **NS-SEC** | | | | |
| **Routine & Manual** | | | | |
| Parent only | | | | |
| Grandparent | 1.13 (0.96, 1.34) | 1.12 (0.94, 1.32) | 1.21 (0.86, 1.71) | 1.13 (0.82, 1.56) |
| Other informal | 0.97 (0.70, 1.36) | 1.03 (0.74, 1.45) | 1.88 (1.21, 2.92)* | 1.84 (1.12, 3.00) |
| Formal | 1.20 (0.99, 1.45) | 1.23 (1.00, 1.50) | 1.36 (0.96, 1.91) | 1.23 (0.85, 1.78) |
| **Intermediate** | | | | |
| Parent only | | | | |
| Grandparent | 1.03 (0.85, 1.24) | 1.04 (0.85, 1.27) | 1.04 (0.64, 1.69) | 1.11 (0.69, 1.76) |
| Other informal | 0.95 (0.68, 1.33) | 0.94 (0.65, 1.35) | 1.17 (0.71, 1.93) | 1.42 (0.83, 2.45) |
| Formal | 0.95 (0.78, 1.16) | 0.97 (0.80, 1.19) | 1.03 (0.69, 1.56) | 1.06 (0.72, 1.56) |
| **Managerial & Prof** | | | | |
| Parent only | | | | |
| Grandparent | 1.16 (0.99, 1.38) | 1.20 (1.01, 1.43)* | 1.62 (1.28, 2.06)* | 1.60 (1.24, 2.06)* |
| Other informal | 1.09 (0.76, 1.56) | 1.16 (0.81, 1.66) | 1.16 (0.77, 1.76) | 1.15 (0.72, 1.83) |
| Formal | 0.96 (0.82, 1.11) | 1.03 (0.88, 1.21) | 1.10 (0.90, 1.35) | 1.11 (0.90, 1.37) |
| **Maternal education** | | | | |
| *No qualifications* | | | | |
| Parent only | | | | |
| Grandparent | 1.27 (0.94, 1.72) | 1.24 (0.91, 1.69) | 1.55 (0.91, 2.61) | 1.31 (0.81, 2.13) |
| Other informal | 1.06 (0.58, 1.95) | 1.28 (0.69, 2.38) | 0.51 (0.17, 1.48) | 0.63 (0.21, 1.95) |
| Formal | 1.17 (0.86, 1.60) | 1.23 (0.87, 1.72) | 0.65 (0.25, 1.66) | 0.66 (0.22, 1.98) |
| *GCSE D-G* | | | | |
| Parent | | | | |
| Grandparent | 1.15 (0.86, 1.54) | 1.24 (0.93, 1.67) | 1.84 (1.08, 3.14)* | 1.61 (1.00, 2.59)* |
| Other informal | 0.79 (0.41, 1.51) | 0.89 (0.49, 1.61) | 2.45 (1.47, 4.09)* | 2.62 (1.56, 4.41)* |
| Formal | 1.08 (0.70, 1.68) | 1.10 (0.71, 1.70) | 1.99 (1.27, 3.11)* | 1.57 (0.85, 2.89) |
| *GCSE A-C* | | | | |
| Parent | | | | |
| Grandparent | 1.08 (0.93, 1.26) | 1.07 (0.91, 1.25) | 1.17 (0.85, 1.60) | 1.10 (0.79, 1.53) |
| Other informal | 1.08 (0.81, 1.44) | 1.08 (0.80, 1.47) | 1.57 (0.99, 2.50) | 1.59 (0.97, 2.62) |
| Formal | 1.02 (0.85, 1.23) | 1.07 (0.88, 1.29) | 1.19 (0.83, 1.70) | 1.13 (0.79, 1.62) |
| *A Levels* | | | | |
| Parent | | | | |
| Grandparent | 1.13 (0.86, 1.49) | 1.10 (0.83, 1.48) | 1.13 (0.62, 2.08) | 1.10 (0.58, 2.10) |
| Other informal | 0.48 (0.23, 1.01) | 0.56 (0.27, 1.15) | 1.59 (0.68, 3.72) | 1.50 (0.51, 4.44) |
| Formal | 0.91 (0.63, 1.31) | 0.99 (0.68, 1.44) | 1.78 (1.28, 2.48)* | 1.71 (1.24, 2.36)* |
| *Diploma* | | | | |
| Parent | | | | |
| Grandparent | 1.05 (0.78, 1.42) | 1.08 (0.80, 1.45) | 0.83 (0.43, 1.63) | 0.86 (0.46, 1.60) |
| Other informal | 1.14 (0.67, 1.95) | 1.16 (0.70, 1.94) | 0.68 (0.25, 1.85) | 0.65 (0.23, 1.87) |
| Formal | 1.20 (0.93, 1.55) | 1.25 (0.95, 1.63) | 0.88 (0.55, 1.41) | 0.92 (0.57, 1.49) |
| *Degree plus* | | | | |
| Parent | | | | |
| Grandparent | 1.90 (1.41, 2.54) | 1.26 (0.97, 1.64) | 1.13 (0.89, 1.43) | 2.22 (1.67, 2.96)* |
| Other informal | 1.43 (0.88, 2.31) | 1.37 (0.89, 2.11) | 1.41 (0.94, 2.11) | 1.60 (0.97, 2.65) |

| | | | | |
|---|---|---|---|---|
| Formal | 0.94 (0.72, 1.21) | 1.26 (0.97, 1.64) | 0.91 (0.75, 1.12) | 0.94 (0.72, 1.23) |
| **Lone parenthood** | | | | |
| *Lone parent* | | | | |
| Parent only | | | | |
| Grandparent | 1.07 (0.81, 1.42) | 0.96 (0.71, 1.30) | 1.43 (0.95, 2.15) | 1.30 (0.87, 1.96) |
| Other informal | 1.24 (0.82, 1.90) | 1.55 (1.03, 2.32)* | 1.16 (0.56, 2.41) | 1.16 (0.52, 2.60) |
| Formal | 1.17 (0.92, 1.48) | 1.27 (1.01, 1.61) | 1.17 (0.80, 1.71) | 1.12 (0.77, 1.62) |
| *Couple family* | | | | |
| Parent only | | | | |
| Grandparent | 1.12 (0.99, 1.26) | 1.14 (1.00, 1.29)* | 1.32 (1.09, 1.60)* | 1.32 (1.09, 1.60)* |
| Other informal | 0.96 (0.77, 1.20) | 0.96 (0.76, 1.21) | 1.49 (1.15, 1.92)* | 1.58 (1.19, 2.10)* |
| Formal | 0.99 (0.88, 1.11) | 1.04 (0.91, 1.18) | 1.14 (0.97, 1.35) | 1.13 (0.94, 1.35) |
| **IMD (quintiles)**** | | | | |
| *Most deprived* | | | | |
| Parent only | | | | |
| Grandparent | 1.02 (0.78, 1.34) | 1.08 (0.81, 1.43) | 1.72 (1.20, 2.46)* | 1.75 (1.25, 2.44)* |
| Other informal | 0.92 (0.56, 1.50) | 0.96 (0.58, 1.60) | 1.44 (0.84, 2.48) | 1.73 (0.95, 3.17) |
| Formal | 0.96 (0.74, 1.25) | 1.04 (0.78, 1.38) | 1.13 (0.75, 1.70) | 1.05 (0.67, 1.66) |
| *4* | | | | |
| Parent only | | | | |
| Grandparent | 1.18 (0.95, 1.46) | 1.16 (0.92, 1.46) | 1.07 (0.64, 1.81) | 1.09 (0.63, 1.88) |
| Other informal | 1.03 (0.62, 1.71) | 1.18 (0.72, 1.93) | 2.10 (1.23, 3.57)* | 2.20 (1.18, 4.08)* |
| Formal | 1.07 (0.82, 1.39) | 1.13 (0.87, 1.47) | 1.23 (0.80, 1.89) | 1.17 (0.77, 1.78) |
| *3* | | | | |
| Parent only | | | | |
| Grandparent | 1.22 (0.98, 1.52) | 1.27 (1.02, 1.59)* | 1.05 (0.60, 1.86) | 0.98 (0.56, 1.72) |
| Other informal | 1.04 (0.65, 1.69) | 1.06 (0.64, 1.77) | 1.28 (0.54, 3.01) | 1.69 (0.67, 4.30) |
| Formal | 1.05 (0.82, 1.35) | 1.09 (0.85, 1.40) | 0.78 (0.45, 1.35) | 0.69 (0.39, 1.21) |
| *2* | | | | |
| Parent only | | | | |
| Grandparent | 0.93 (0.70, 1.24) | 0.94 (0.70, 1.28) | 1.57 (0.95, 2.59) | 1.61 (1.04, 2.49)* |
| Other informal | 0.87 (0.46, 1.65) | 0.65 (0.31, 1.34) | 1.14 (0.50, 2.62) | 1.12 (0.48, 2.64) |
| Formal | 0.85 (0.65, 1.10) | 0.89 (0.68, 1.17) | 1.19 (0.83, 1.72) | 1.24 (0.84, 1.84) |
| *Least deprived* | | | | |
| Parent | | | | |
| Grandparent | 0.84 (0.60, 1.17) | 0.92 (0.65, 1.29) | 0.80 (0.33, 1.96) | 0.79 (0.28, 2.21) |
| Other informal | 0.81 (0.43, 1.53) | 0.92 (0.49, 1.73) | 0.95 (0.18, 5.10) | 1.16 (0.19, 7.00) |
| Formal | 0.82 (0.65, 1.04) | 0.90 (0.70, 1.15) | 1.09 (0.76, 1.55) | 1.03 (0.70, 1.50) |

*<=0.05. **England only. [1] Adjusting for maternal age, ethnicity, number of children in household at age 3 years, pre-pregnancy maternal overweight, birth weight, smoking during pregnancy, NS-SEC, maternal education and lone parenthood, age in months

Missing: BMI 1247, childcare 926, NS-SEC 176, maternal education 31, maternal age at first live birth 428, ethnicity 31, maternal pre-pregnancy overweight 886, birthweight z score 169, smoking during pregnancy 60, no children in household 51, age 51

# **Appendix 9:** Supplementary information for Chapter 9 "Involving young people in public health research and obtaining their views"

This appendix contains material used in the two sessions with the young persons' public health reference group (PEAR), and the outcomes of the sessions.

## First session with Pear group, 2008

### Appendix 9.1: Introductory sheet

### Mapping health inequalities in early years- project summary

The aim of our project is to explore how government action might influence the health of children when they are very young (i.e. under 5 years) and also the health gap between the rich and poor.

In this context we think about government action as being:

- *Aims*- e.g. the government aims to increase employment rates
- *Guidance*- e.g. the government recommends children are immunised with the measles, mumps and rubella vaccine (MMR) by the time they reach age 13 months
- *Rules and regulations*- e.g. the ban on advertising unhealthy food during television programmes aimed at children

We want to explore lots of different measures of child health such as:

- *Child wellbeing*, e.g. whether they are generally happy or how comfortable they are when spending time away from mum.
- *Child health behaviours*, e.g. the food they eat or how physically active they are
- *Mother's health behaviours*, e.g. whether she has her child immunised or if she smokes in the child's presence
- *Health conditions*, such as common colds or chickenpox

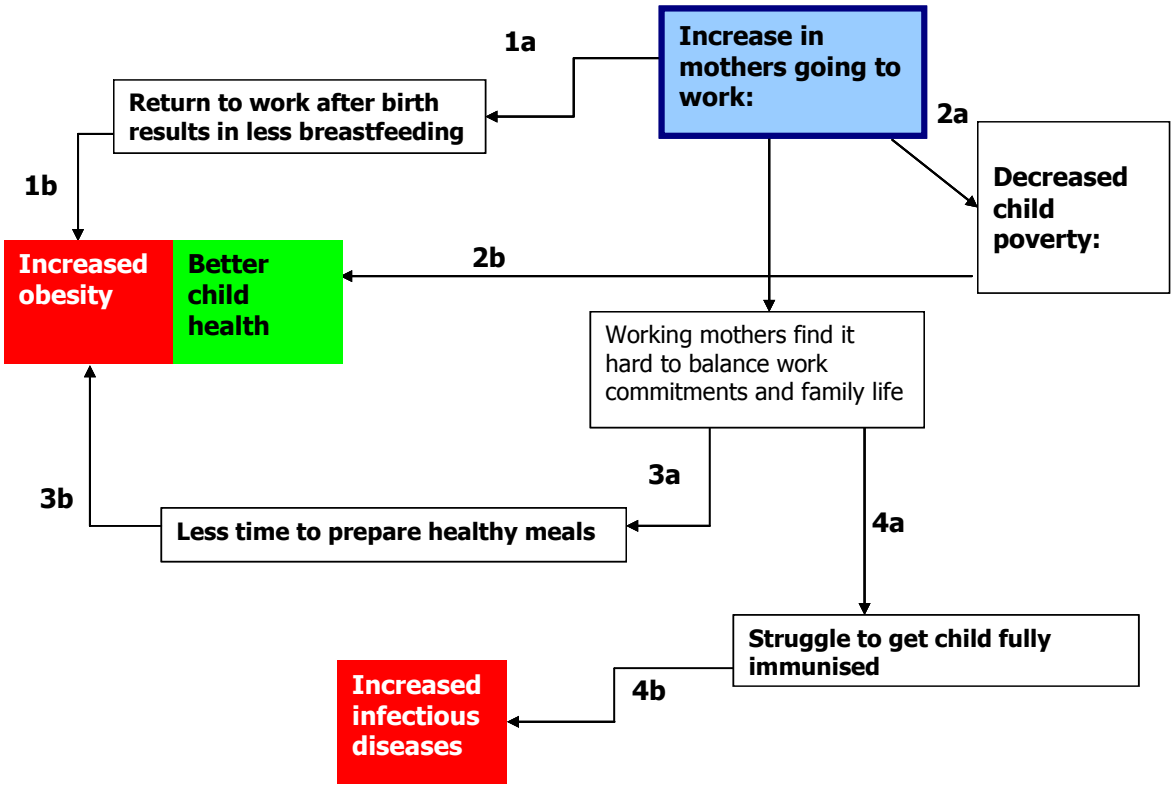
We want to do this by exploring two examples:

*Example 1:* We will take a particular government action and think about how it could influence all different indicators of children's health. The government action we have chosen is increasing the number of children in *childcare*.

*Example 2:* We want to pick a measure of child health and think about how different government actions might influence it. The measure of health we have chosen is *injury*.

In a while we will ask you to split into two groups, one group will concentrate on childcare and the other will concentrate on childhood injuries. On a separate sheet of paper you will find some further information about your case study. Overleaf are some other examples of how government action could affect young children's health.

**Government action example: mother's employment and child health.**

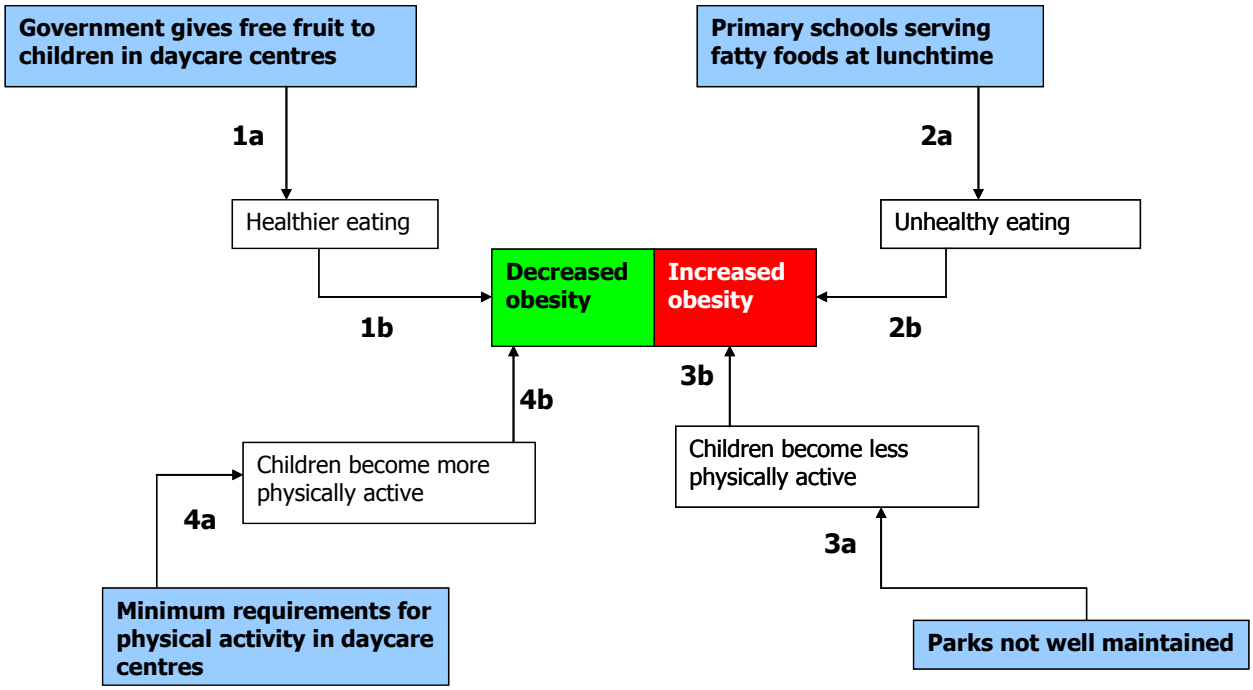



The government wants to increase the number of mothers who work….

1. Mothers who work are less able to breastfeed their child (1a) and not breastfeeding increases child mortality (1b).

2. On the other hand by increasing employment the number of children living in poverty will fall (2a). Children who live in poverty are more likely to die at a young age, and so this will reduce child mortality (2b).
3. Working mothers might not find time to cook healthy dinners (3a) and this could increase obesity levels (3b).
4. Working mothers may also struggle to take their child to the doctors to get them immunised (4a), increasing their chances of catching infectious diseases (4b).

## Health example: childhood obesity and government actions




We want to think about what government actions might influence childhood obesity…

1. If the government was to give out free fruit in daycare centres, children might eat healthier diets (1a) and this could reduce the chance of being obese (1b)
2. If the government allows schools to offer fatty food children are more likely to eat unhealthily (2a) and therefore more likely to become obese (2b)

3. If the government does not invest in the maintenance of parks then parents may not feel that children are safe to play there. This could reduce children's levels of activity (3a) and therefore increase their chance of becoming obese (3b).
4. If the government recommends a minimum number of hours that children should be physically active for in daycare centres, then children might exercise more (4a), and are therefore less likely to become obese (4b)

**Appendix 9.2: Pair worksheet 1**

## Group 1 worksheet- Injuries

In the UK, injuries are the biggest cause of death and a major cause of ill-health and disability in children. We want to explore how the government might influence the number of injuries that occur in young children, and especially the number that occur to children from poor families and areas.

Injuries can be anything from minor scrapes and bruises, to poisoning, smoke inhalation and serious head injuries. These might occur in or outside the home.

**Task:**

We'd like you to think about how government action might influence the occurrence of injuries in children under 5 and show your ideas in a flowchart. Remember, government action can include aims, regulations or guidance and it can be either real or you can make it up. If it helps you can imagine that you are:

- Gordon Brown- you want to reduce the number of injuries in children and you have as much money and time as you like. What would you ban, change, or introduce?
- An infant or young child- what do you think would put you at more or less risk of injury?
- A mother with an infant or young child- what would you like the government to do to help you keep your child safe?

We have provided you with some boxes to create a flowchart. One of the boxes represents injuries. There are a few boxes with some government actions on (you do not have to use these) and some which are blank so you can think of other things the government does or could do that might influence injuries.

**Appendix 9.3: Pair worksheet 2**

## Group 2 worksheet- Childcare

The UK government wants to increase the number of childcare places available so that mothers can go to work. We want to explore how being looked after in a daycare centre or by a childminder, friend or relative might influence the health of young children and whether it will affect the health gap between the rich and poor.

**Task:**

We'd like you to think about how childcare might affect young children's health and show your ideas in a flowchart. If it helps you can imagine that you are:

- A young child who is taken to a childminder or a daycare centre- what sorts of things do you think could affect your health (in a good or bad way)?
- A mother with a young child who is being looked after by someone else whilst you go to work- what would you look for in a daycare setting and what things would worry you?
- A member of staff at a daycare centre or a childminder working from your own home. What would you offer in order to promote children's health and what would you avoid?

Health is not limited to illnesses; it can also include health behaviours such as diet, and measurements of wellbeing such as confidence with others or feeling happy.

We have provided you with some boxes to create a flowchart. One of the boxes represents childcare. There are other boxes with some measure of health already on them (you do not have to use these) and some empty boxes for you to think of other types of health that might be affected.

## Appendix 9.4: Summary of findings used to feed back to the group

Summary

In the ‘Mapping health inequalities in early years’ session the group discussed how government action could influence young children’s health. The group was split into two to create flowcharts. One group thought about how being in childcare could influence different aspects of child health, and the other considered what the government could do to reduce injuries in childhood. Once the flowcharts were created they were stuck on up on the wall and discussed by the group as a whole.

When considering childcare it was thought that the quality, cost and type of childcare was important, particularly in relation to what the alternative to childcare would have been (for example household conditions). The balance between cost and quality was talked about, for example more expensive childcare would probably provide more healthy food, but as the same time the increased cost could mean fewer resources to buy healthy food at home. Exposure to greater numbers of children in a daycare centre could mean there are more opportunities for physical activity (e.g. playing games), but at the same time infectious diseases could spread more quickly. By putting their child in care, mothers would be able to get a job and bring economic stability to their family, although mother-child relationships could be disrupted. It was thought that personal experiences of childcare would also be important, with children who did not have good experiences being less willing to learn later on in life when at school. This would not only affect the individual but also their peers who may receive less attention in the classroom as a result. It was concluded that by offering free or subsidised daycare of a consistent quality the government could limit the need for parents to balance quality and cost.

Injuries were not only considered to be cuts and bruises, but also emotional or mental harm, and negative physical and mental health in children caused by their parents or the media. For example by educating parents about the risks and consequences of their actions, they might be less inclined to smoke in front of their children, who in turn would not suffer from negative

health consequences of passive smoking. It was thought that different parents may react differently to education and advice, and in some cases it could have a negative effect. The media might encourage children and young people to adopt risky behaviours or develop eating disorders, although it was suggested that the government could try to counteract this through promoting more positive role models. Through eating too much and not exercising enough, children could become obese and consequently suffer both physically and mentally. On the other hand, increased physical activity could lead to increased risk of broken bones and grazes. Family problems and other societal pressures could lead to stress and poor emotional health. Booster seats could reduce the dangers of car journeys and safer equipment in playgrounds could reduce injury. Leaflets with advice on good practice and websites for further information could be given out at birth, particularly to first time parents.

Encouragingly, the content of the posters and discussion were not dissimilar from that found in the literature. The session also added some new information about aspects which are of particular importance to young people and this will help to direct the next steps of the project.

## Second session with PEAR group, 2010

### Appendix 9.5: PowerPoint slides

# Inequalities in child health

## Background

Aim:

•To explore how government action might influence the health of preschool children (under 5 years old)

•And also the health gap between the rich and poor



## Government action=

- *Aims*- e.g. the government aims to increase employment rates
- *Guidance*- e.g. the government recommends children are immunised against Meningitis by age 3 months
- *Rules and regulations*- e.g. the ban on advertising unhealthy food during television programmes aimed at children
- *Using public money- e.g. funding free childcare places for 3-4 yr olds*

DH Department of Health | department for children, schools and families | DWP Department for Work and Pensions

## 2 case studies

- *Case study 1: government action*

*Childcare*
- daycare centres
- grandparents

→ Children's health


## 2 case studies

- *Case study 2: health measure*

*Unintentional injury*
•e.g. banged head
•burn from spilt hot water

← Government actions

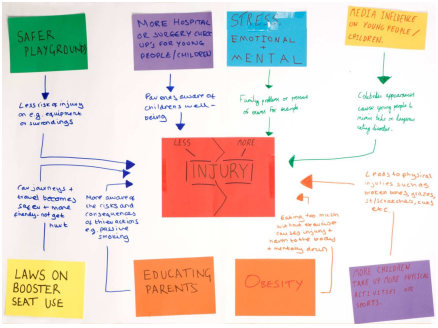

- We conducted a review of research to find out what was already known for the two case studies and where further research was required

## At the last PEAR meeting

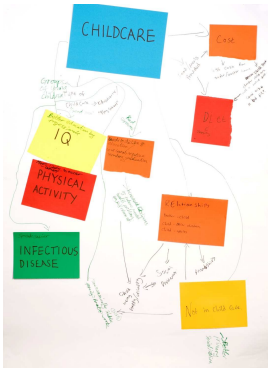
- At the meeting we asked the PEAR group to create flowcharts to show what they thought might be going on in the two case studies

## Attended a PEAR session

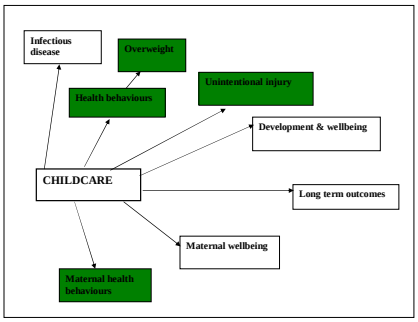
## Government actions that might influence accidental injuries in children



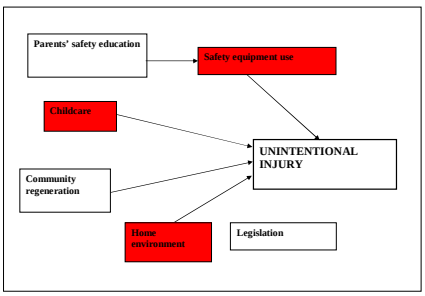

## Aspects children's health and wellbeing that might be influenced by childcare




## Childcare 'map'




## Childhood accidental injury 'map'

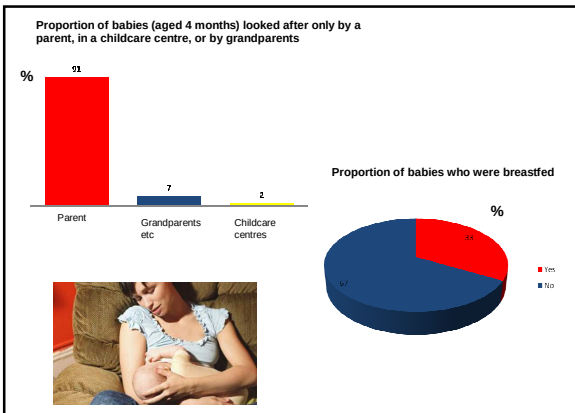



## Aims for today

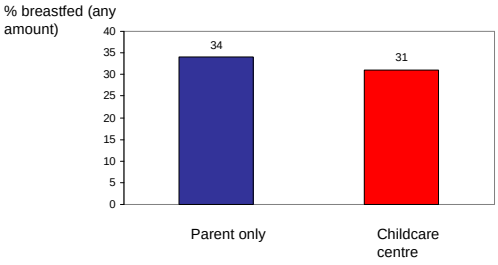
Discuss our results from some new analyses we have conducted for areas which were less well researched

1. What do you think our results mean?
2. What you think the government could do to help improve young children's health in these specific areas?

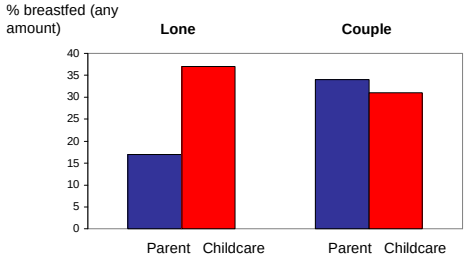
# Scenario 1: Childcare and breastfeeding




Babies who are looked after in childcare centres are slightly less likely to be breastfed…

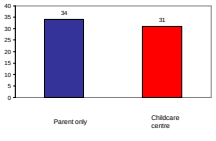



However lone mothers who used childcare were more likely to breastfeed than lone mothers who looked after the baby themselves all of the time




## Q1. So let's think about why this might be happening.

a) Why do you think that, *overall,* mothers who use childcare are slightly less likely to breastfeed than mothers whose baby is looked after by a parent all of the time?



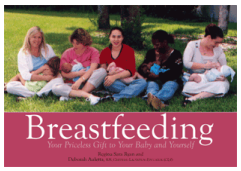

Possible explanations….

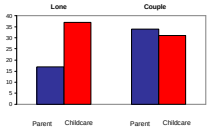
?

- Busy with work and home life, don't have time to store breast milk in bottles to bring to childcare or the childcare centre doesn't offer storage facilities for bottled breast milk
- Childcare staff to use formula milk instead
- Mother decides to give up breastfeeding altogether
- Explained by something else?



b) Why are lone mothers *more* likely to breastfeed if they use childcare than lone mothers who do not use childcare?






Possible explanations….

?

- Meet other mothers at the childcare centre. They swap information and advice about breastfeeding and working.
- Can also get advice from childcare staff
- Lone mothers who do not use childcare may not have friends sharing similar experiences.
- If they find breastfeeding hard they may not have someone to turn to for help and support and so decide to use formula milk instead.
- Confounding?

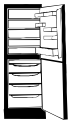

Q2. What do you think the government could do to make breastfeeding easier for mothers who use childcare to breastfeed?

If it helps you can imagine that you are:

- The Prime Minister- you want to increase the number of mothers who breastfeed and you have as much money and time as you like. What changes to childcare would you make?
- A mother with an infant - what do you think would make it easier for you to breastfeed and how could this be applied in childcare centres?

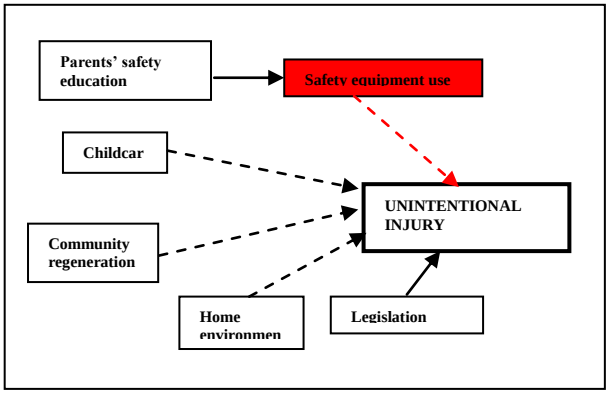

?


- Train childcare staff to encourage mothers to breastfeed at home and to offer fridges so that they can bring bottled breast milk along to childcare.
- Employers could provide crèches at work, so that mums can breastfeed in their lunch breaks.
- Or make it law that there is a room at work where mums can go to express milk, provide pumps.
- Make breastfeeding more acceptable- for example, do you know many celebrities who breastfed? It is now illegal in Scotland to prevent breastfeeding in public places such as on buses and in restaurants.



**Appendix 9.6: Worksheet: Pair one**

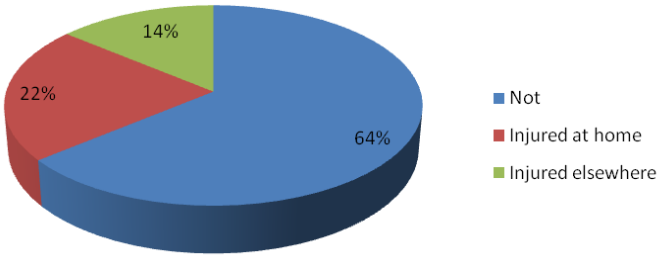
# Safety equipment use and injuries in the home




## Results

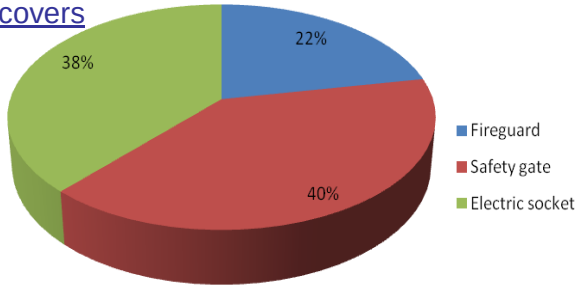
**22% of 3 year olds had been injured at home**

Percentage of toddlers (age 3 years) who were injured



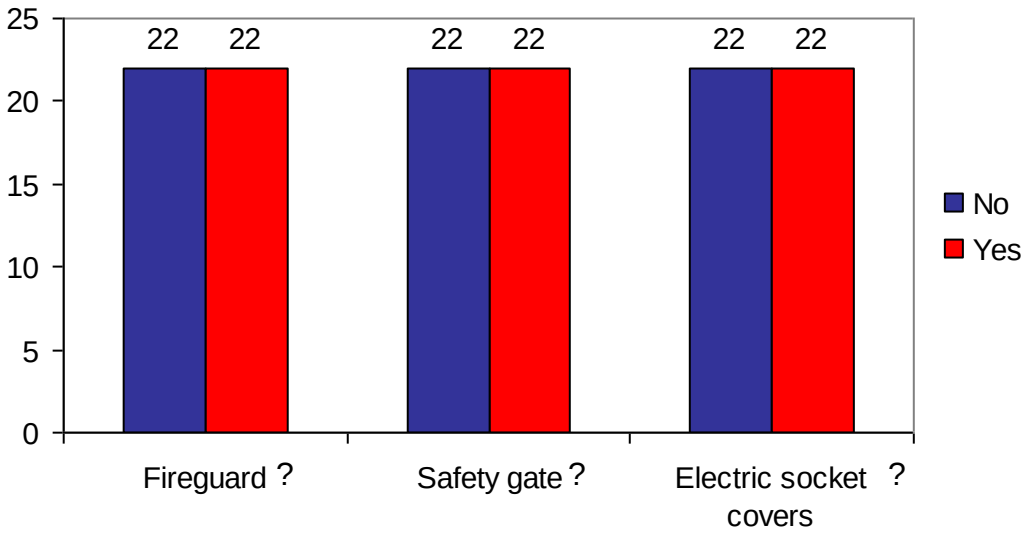

**22% toddlers lived in households which used a fireguard, 40% used a safety gate, and 38% used electric socket covers**

Percentage of homes using fireguards, safety gates and electric socket covers



**Safety gates, fire guards or electric socket cover use, did not influence injuries occurring in the home in toddlers (age 3 years)**

% injured at home, according to safety equipment use




## Q1. So now let's think about why this might be happening

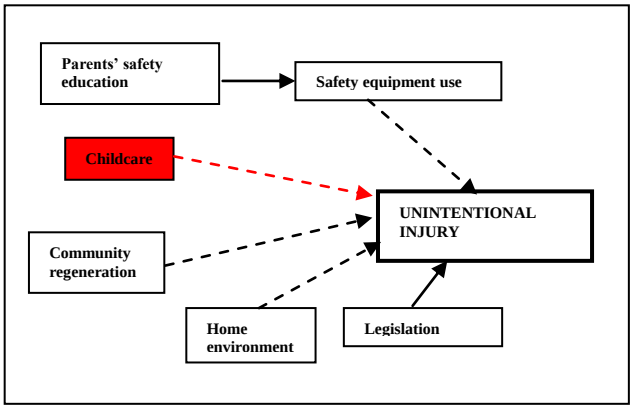
a) Why do you think that using safety gates, fire guards and electric socket covers does not reduce injuries occurring in toddlers in the home?

## Q2. What else do you think the government could do to help prevent injuries occurring in the home? If it helps you can imagine that you are:

- The Prime Minister- you want to reduce childhood injuries occurring in the home and you have as much money and time as you like. What would you do?
- A parent of a toddler - what do you think would make it easier to keep your child safe from injury at home?
- A toddler- would do you think would help stop you from being injured in your home?

**Appendix 9.7: Worksheet: Pair two**

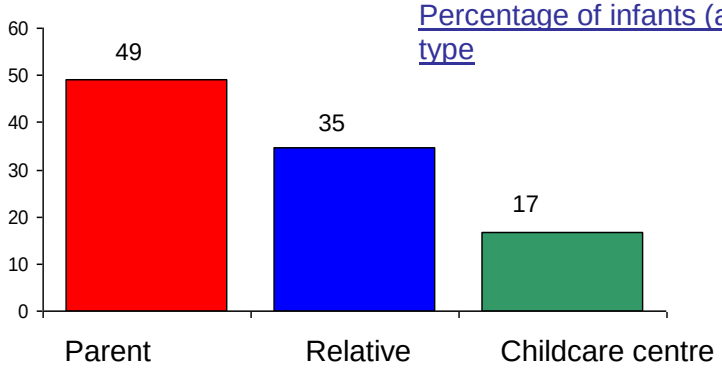
# Childcare use and injury




## Results

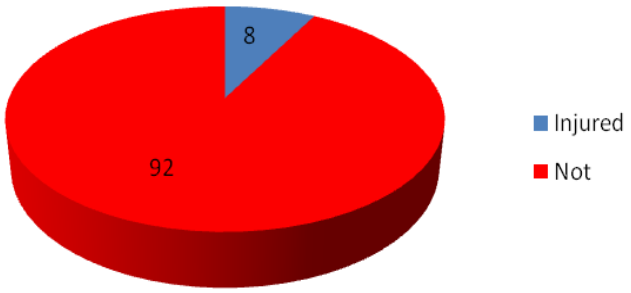
**17% of infants were looked after in a childcare centre**

Percentage of infants (age 9 mths) by childcare type




**And 8% had been accidentally injured (anywhere)**

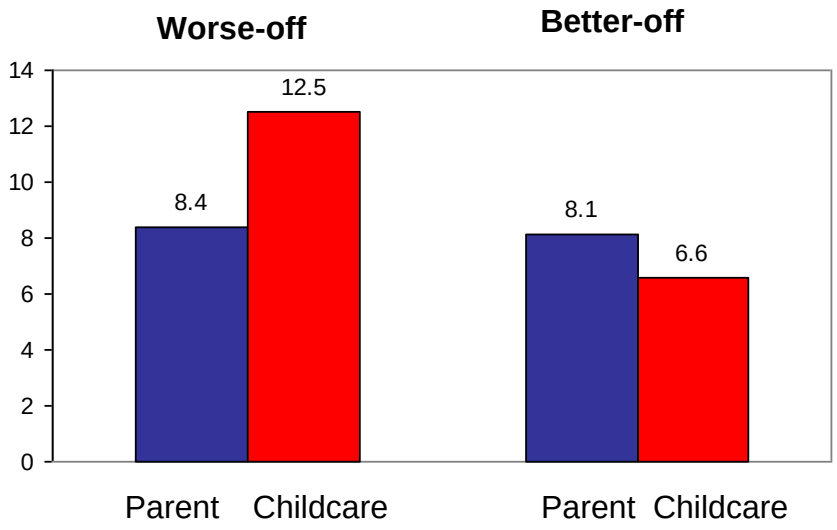
Percentage of infants (age 9 mths) who were injured




**NB we don't know where the injuries took place- some will have been at home, others in childcare**

**Infants (aged 9 months) who were looked after in childcare centres were *more* likely to be injured than those looked after by a parent, if they were from *worse-off families* (in terms of education and occupation)**

% injured by childcare type




**However infants who were looked after in childcare were *less* likely to be injured than children who were only looked after by a parent, if they were from *better-off families***

## Q1. So now let's think about why this might be happening.

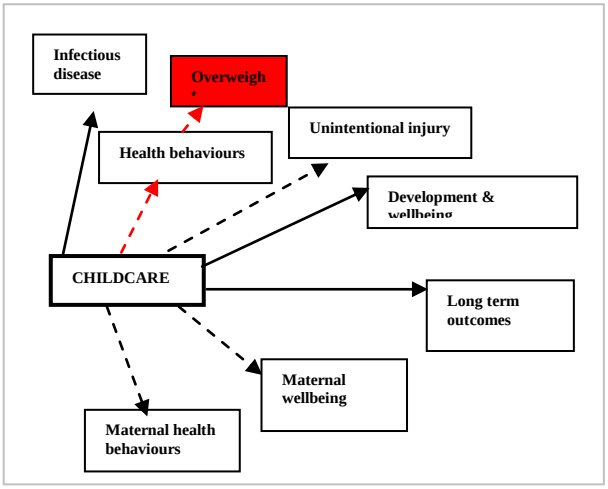
a) Why do you think infants from better-off families are less likely to be injured if they are looked after in childcare compared to those looked after by a parent all of the time, whilst infants from worse-off families are more likely to be injured if they are looked after in childcare?

## Q2. What do you think the government could do to help prevent injuries in worse-off infants who are looked after in childcare? If it helps you can imagine that you are:

- The Prime Minister- you want to reduce the number of injuries that occur in infants who are looked after in childcare and you have as much money and time as you like. What changes would you make?
- A parent with an infant - what changes do you think could you or others could make to reduce the chance of injury in your infant?

**Appendix 9.8: Worksheet: Pair three**

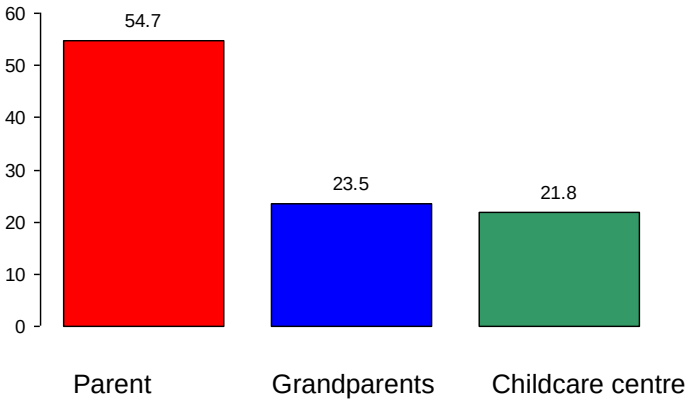
# Childcare use and childhood overweight




## Results

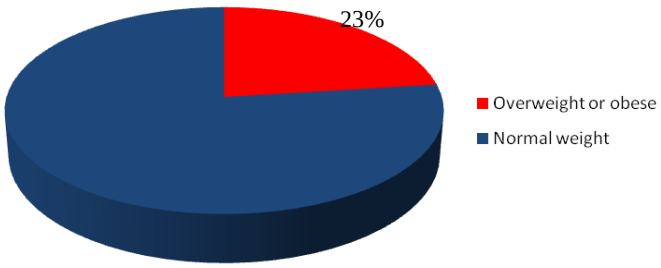
**Almost one quarter of toddlers were looked after by grandparents**

Percentage of toddlers (age 3 years) by childcare type



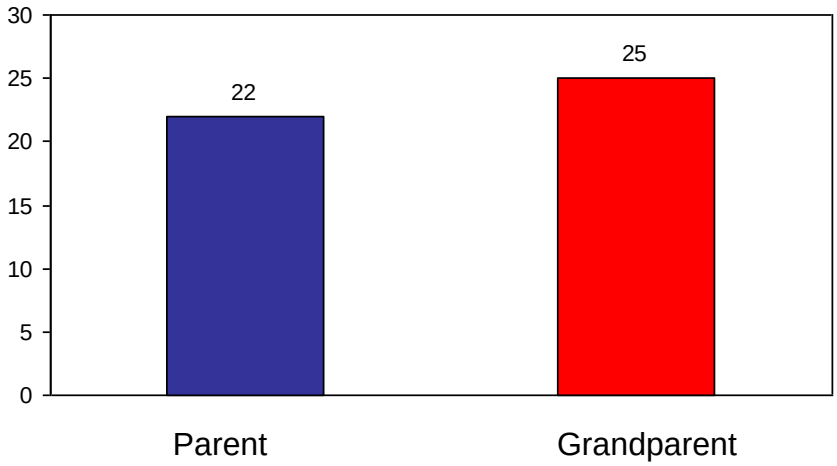

**And almost one quarter were overweight or obese**

Percentage of toddlers (age 3 years) who were overweight or obese

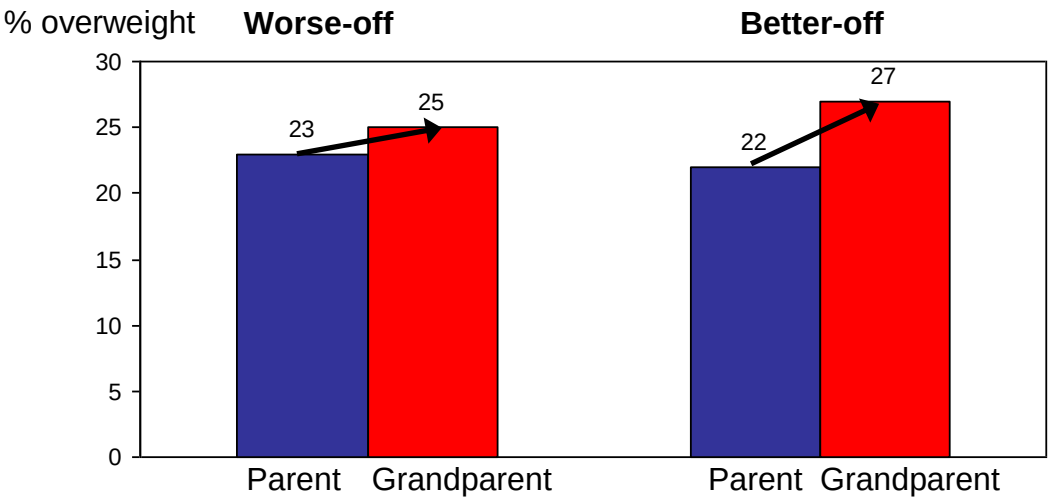


**Toddlers (aged 3 years) who were looked after by a grandparent were slightly *more* likely to be overweight than toddlers who were only looked after by a parent.**

% overweight by childcare type




**And toddlers who were looked after by a grandparent were even more likely to be overweight (compared to those only looked after by a parent) if they were from *better-off families* (in terms of education and occupation)**



## Q1. So now let's think about why this might be happening

a) Why do you think toddlers who are looked after by a grandparent are more likely to be overweight than children who are only looked after by their parents?

b) Why do you think this is more likely to be the case for toddlers from better-off families?

## Q2. What do you think the government could do to help prevent this from happening? If it helps you can imagine that you are:

- The Prime Minister- you want to reduce the proportion of children who are overweight and you have as much money and time as you like. What changes would you make?
- A grandparent looking after your young grandchild - what do you think would make it easier for you to help stop your grandchild becoming overweight?

## Appendix 9.9: Summary of findings used to feedback to the group

The session kicked off with Catherine and Anna updating the group on the aim of their project. They also updated on how the discussion from a previous PEAR meeting (then known as Young Person's Public Health Group) that they attended at the beginning of their project in 2008 had helped them to shape the rest of the project.

The remainder of the session was spent looking at some of the findings that had come out of the project since then, using data from a large survey called the Millennium Cohort Study. Firstly the group went though an example together- looking at some data which explored childcare use in relation to breastfeeding. Then the group divided into 3 pairs and discussed one set of results each: childcare and injury, childcare and overweight, safety equipment use and injury.

**Discussion of the results:**

*Childcare and breastfeeding*

The results from this analysis showed that babies (4 months old) who were looked after in childcare centres were slightly less likely to breastfeed than those who were only looked after by a parent. The group discussed why they thought this might be and came up with the following:

- Mother's are busy with balancing work and their home life and so are too busy to breastfeed
- Because some babies will be receiving formula milk in childcare, those mothers decide to give them breast milk all of the time

The results also indicated that lone mothers were actually *more* likely to breastfeed if they used childcare. The group thought this might be because:

- These mothers are probably working and so can get information when at work
- They might also meet other mums at the childcare centre who can swap advice and information

When thinking about what the government could do in response to these findings the group came up with the following ideas:

- Employers could provide crèches so that mothers can breastfeed in lunch breaks

- Or they provide rooms so that mum can express milk
- Childcare providers should provide fridges to store expressed breast milk

*Safety equipment and injury*

The results for this analysis indicated that using safety equipment did not influence injury in 3 year olds. Reasons for this might be:

- Parents are more relaxed at home and worry about injuries less (and they are more risk aware when outside their home)
- The safety equipment explored (safety gates, fire guards and electric socket covers) cannot protect children from all injuries
- You can't stop everything!
- Safety equipment might not be used correctly or at all

It was thought that the government could do the following to try and reduce injuries in the home:

- Provide information booklets to the parents on how to use equipment correctly and also highlighting other potential hazards in the home
- Health visitors could give advice about hazards specific to each household in their usual visits
- Tie safety advice to the developmental stage of the child

*Childcare and injury*

The data from this analysis showed that babies (age 9 months) from worse-off backgrounds were more likely to be injured (anywhere) if they were looked after in childcare compared to babies only looked after by a parent. Babies from better-off backgrounds were less likely to be injured than those who were looked after by a parent. This contrast in results might be explained by the following:

- Babies from better-off backgrounds attend better quality childcare centres which have safety equipment and safety policies, they have safer toys, more staff, and staff who are more aware of potential dangers
- Babies from worse-off backgrounds attend childcare centres which are not so high quality; they have less safe conditions and staffing issues (i.e. not enough staff). Children from worse-off backgrounds might also be attending different sorts of childcare than those from better-off backgrounds.

When thinking about what the government could do:

- Subsidise childcare centres

- Stricter rules in childcare centres about what children can and can't do and how they should be kept safe (although rules shouldn't be too strict as this will stop children from enjoying and learning)
- Promotion of safety in childcare
- More staff in childcare centres and better training

*Childcare and overweight*

These results showed that children (3 years old) who were looked after by a grandparent were more likely to be overweight or obese. It was thought that this might be because:

- Grandparents like to spoil their grandchildren for example by giving them sweets
- They may be less educated and so know less about the importance of young children eating healthily and being active
- They also often feel that it is their role to feed you

When exploring this in different groups, the results showed that only children from better-off families were more likely to be overweight if they were looked after by a grandparent. Reasons for this might be:

- Better off grandparents have 'richer' foods which could be more unhealthy, or they might give children more to eat (e.g. a better off grandparent might give the child as much cake as they like, whereas the poorer grandparent would have to ration it)
- Better off grandparents might be more likely to have a car or use taxis whereas less well off grandparents would be more likely to walk and use public transport

Things that the government could do to address this include:

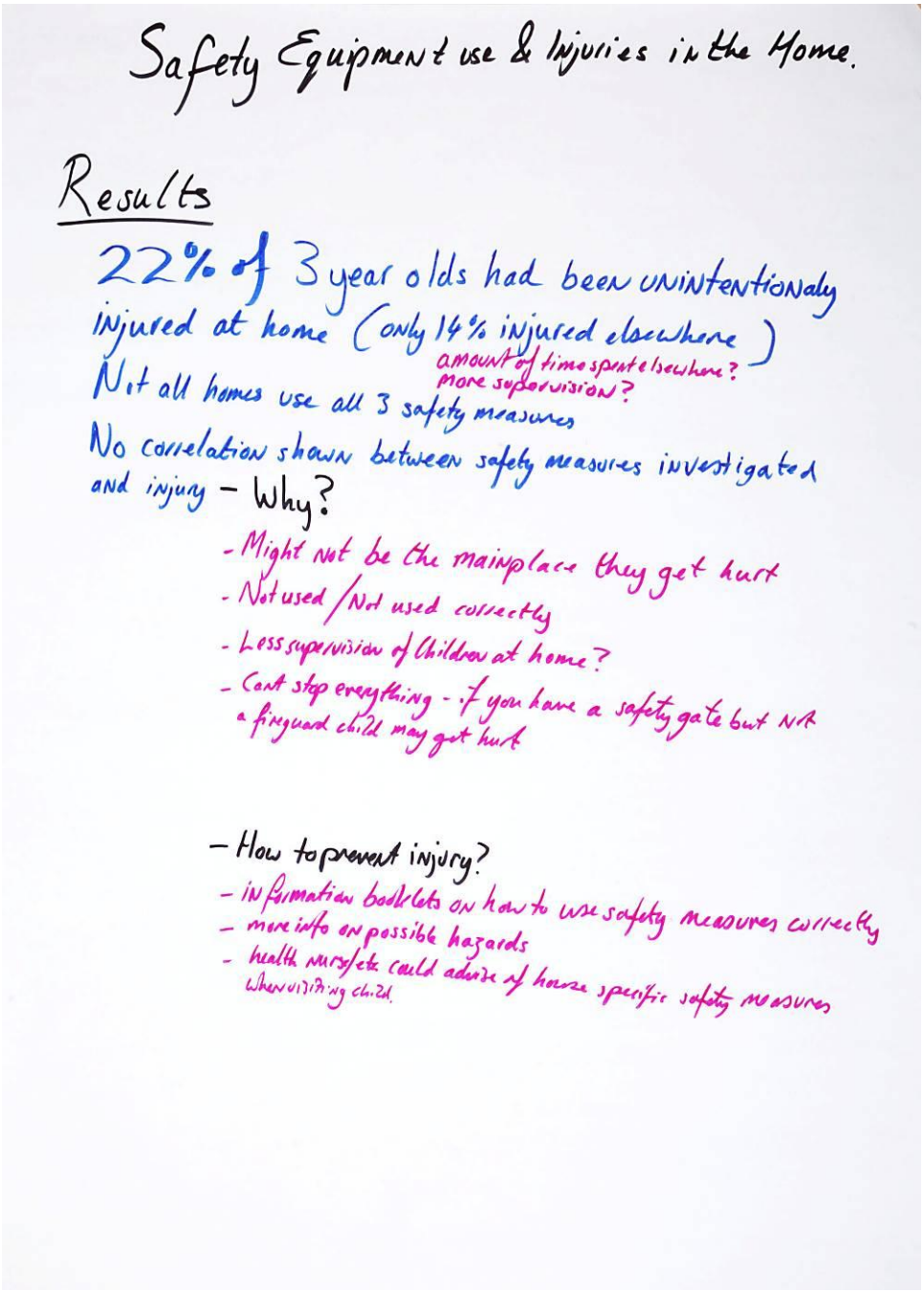
- More education about healthy diets and exercise for the elderly, including shock tactics
- Provide grandparents who are carers with more support- e.g. places or people to take grandchildren to be physically active
- Information about different types of exercise they can do with grandchildren
- Health promotion directed at grandparents through the media
- More exercise programmes offered (school clubs and out of school) which grandparents can take grandchildren to- e.g. make SureStart centres more accessible to grandparents?

**Using the information from the session**

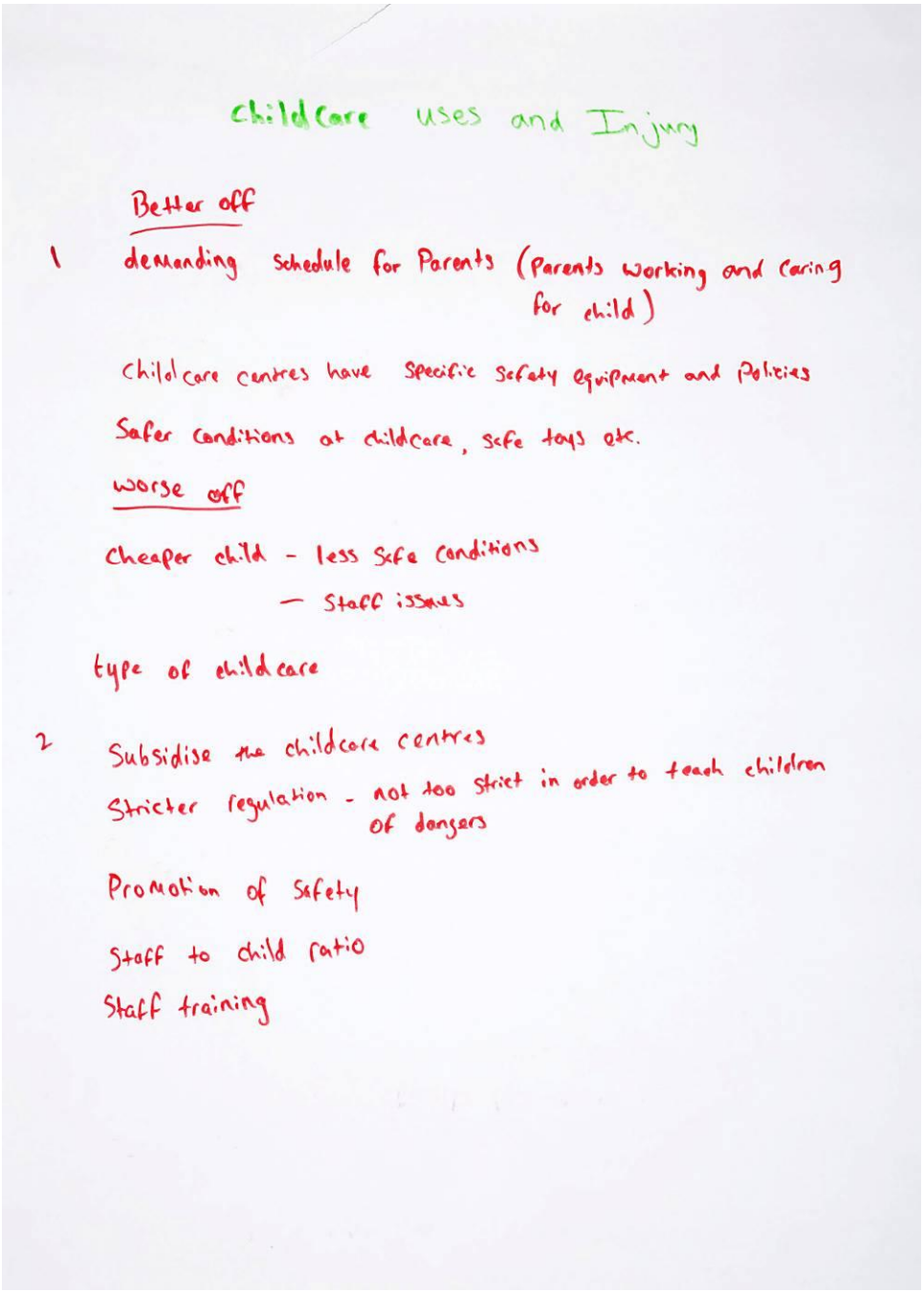
Encouragingly many of the things discussed in the group had also been highlighted the literature. Others we had also thought of when discussing results with other members of the project team, and so it was positive to have these reinforced by the PEAR group. In addition the group raised some things which we had not thought of in relation to these analyses and which we will now include in our report to the Department of Health. These include emphasising the importance of still allowing children to explore their boundaries when devising safety regulations for childcare, the possibility that better-off grandparents might be more likely to use cars and taxis and therefore be less active with their grandchildren, and the potential to use existing systems, such as health visiting, to highlight hazards specific to individual homes which could cause injury to young children.

The flip chart sheets produced by each of the teams are show overleaf.

Team 1: Safety equipment use and injuries in the home



Team 2: Childcare use and injury



Childcare uses and Injury

Better off

1 demanding schedule for Parents (Parents working and caring for child)

Childcare centres have specific safety equipment and Policies

Safer conditions at childcare, safe toys etc.

worse off

Cheaper child - less safe conditions
— staff issues

type of childcare

2 Subsidise the childcare centres

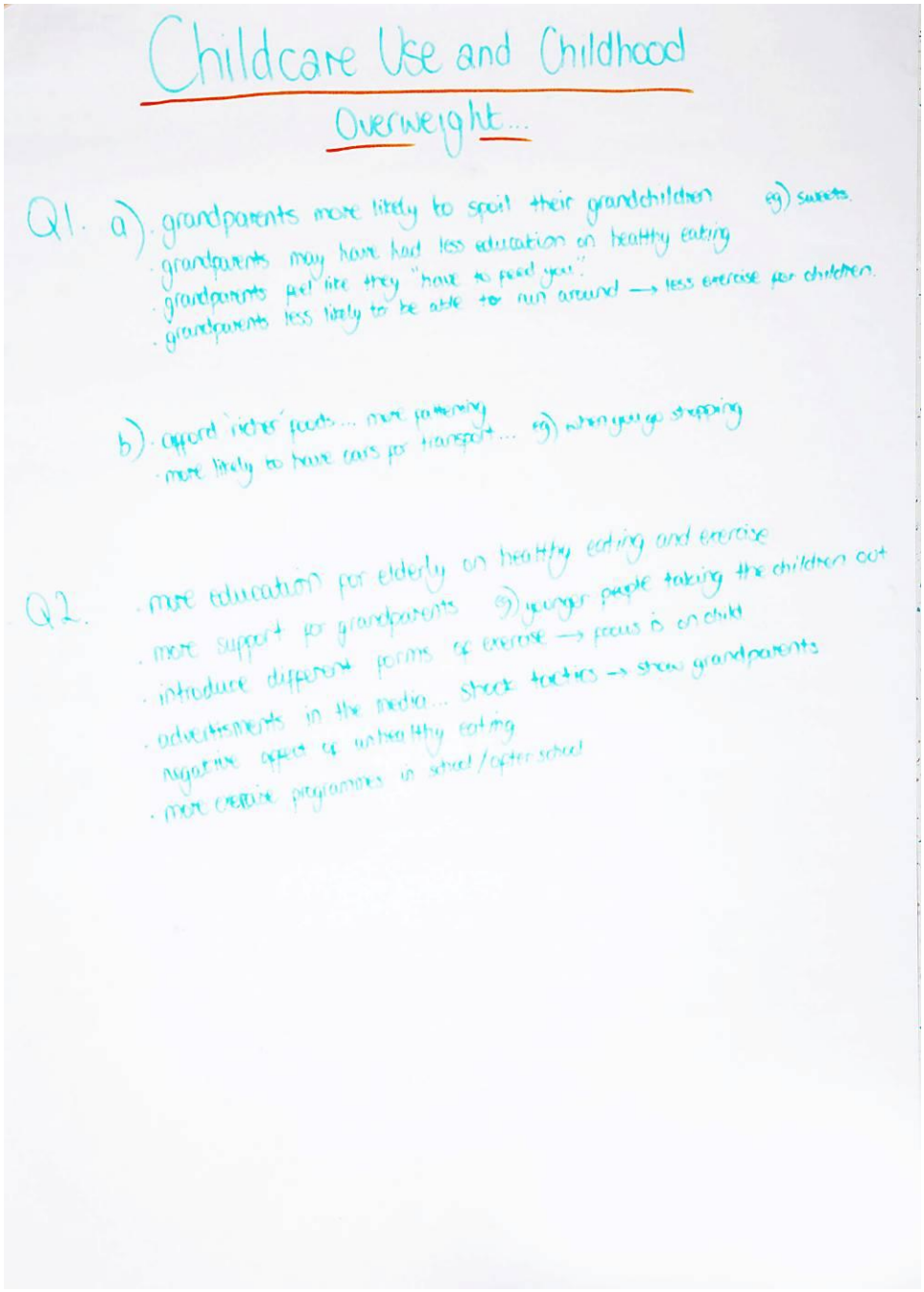
Stricter regulation - not too strict in order to teach children of dangers

Promotion of Safety

Staff to child ratio

Staff training

Team 3: Childcare use and childhood overweight



## Appendix 9.10: Newsletter from the PEAR group, February 2010

# London PEAR Meeting Newsletter
# 15th February 2010

**Who was there:**
Laura, Amrita, Bhavika, Ellie, Callum and George
**Facilitators:** Louca-Mai, Anita and Deepa
**Visitors:** Anna and Catherine (Institute of Child Health), Alix (National Institute for Health and Clinical Excellence, NICE) Steven and Niamh (Anglia Ruskin University)

## Introductions
The group played the 'Telephone Charades' icebreaker game to start with. The group also looked at the minutes of previous meetings and the agenda for the day. They were also updated on the NRES conference that Callum and Amrita attended with Louca-Mai.

## Session 1 – Inequalities in child health
In this session Catherine and Anna from the Institute of Child Health updated the group on the aim of their project on inequalities in child health. They were also updated on how the discussion from a previous meeting from the pilot project that they attended, had helped to shape the rest of the project.

## What did we do?
In small groups, they discussed research findings on different areas, such as childcare and injury, childcare and overweight and safety equipment use and injury, and thought about what the government could do to improve child health.

## Session 2 – The PEAR research project
In this session Steven and Niamh from Anglia Ruskin University introduced themselves and explained what the research project involved, and how they would work with the group. The PEAR group members were also given the opportunity to ask any questions on the cyber-bullying research project.

## What did we do?
In small groups, they were asked to comment on the draft questionnaire developed for young people and to come up with their definition of cyber-bullying. The group members were also asked to put their names down for what activities they would like to be involved in for the research project.

## Session 3 – Working with National Institute for Health and Clinical Excellence (NICE)

In this session Alix talked to the group about NICE and how they could get involved in the work that NICE does.

## What did we do?

Alix asked the groups to look at pieces of published health guidance related to young people and brainstorm on:

- what key messages they would give to young people and
- how they would give these key messages to young people

## Session 4 – The group's work

In this session Louca-Mai asked the groups to think about whether they would like to be involved in speaking at some conferences and writing a book chapter. They also contributed to a new research proposal on alcohol and discussed how young people could get involved. The group was also updated on the website and started to design a flyer for the conference.

## Session 5 – Closing section

The groups were asked to evaluate their experience at the meeting. Most liked the NICE session, but wanted more time for the other sessions during the day.

## Date of next meetings

London – Wednesday 7th April 2010

## *Comments Board:*

Below are some of your comments on the February meeting:

**The best thing about today was....**

*"Meeting the researchers who are carrying out the project"*

*"Discussing upcoming opportunities and the conference"*

*"When NICE came on it was very interesting"*

*"The feedback from Catherine Law and Anna"*

**What could have been better, and why?**

*"Being on schedule and longer periods of time for the conference planning and presentation"*

*"More time for activities as it felt rushed and not everything was completed"*

**Next time please....**

*"Add more activities"*

*"More time spent on activities (possibly restructuring of day plan)"*

*"A brief evaluation of what we have achieved to date to tie in everything we have done so far"*

**Appendix 10:** There is no supplementary information for Chapter 10 “Synthesis”

**Appendix 11:** There is no supplementary information for Chapter 11 “Discussion”